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The CHEMICAL AGE

VOL LX 2 APRIL 1949 No 1551

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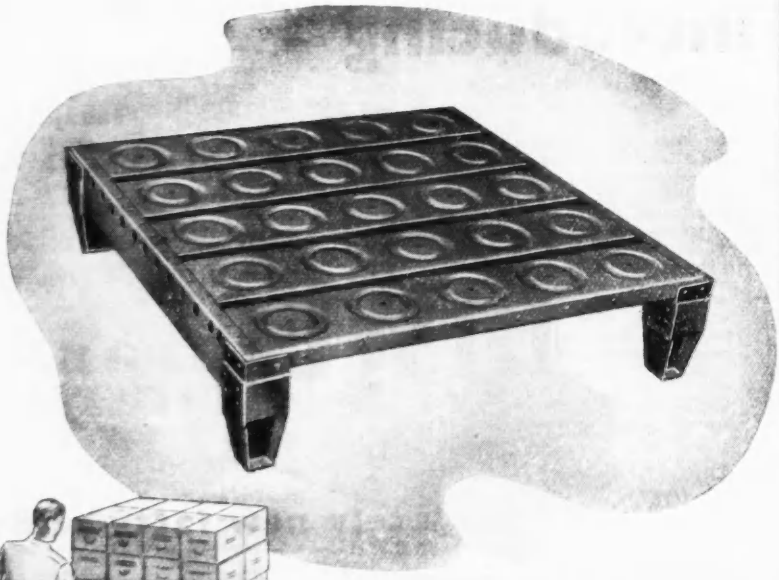

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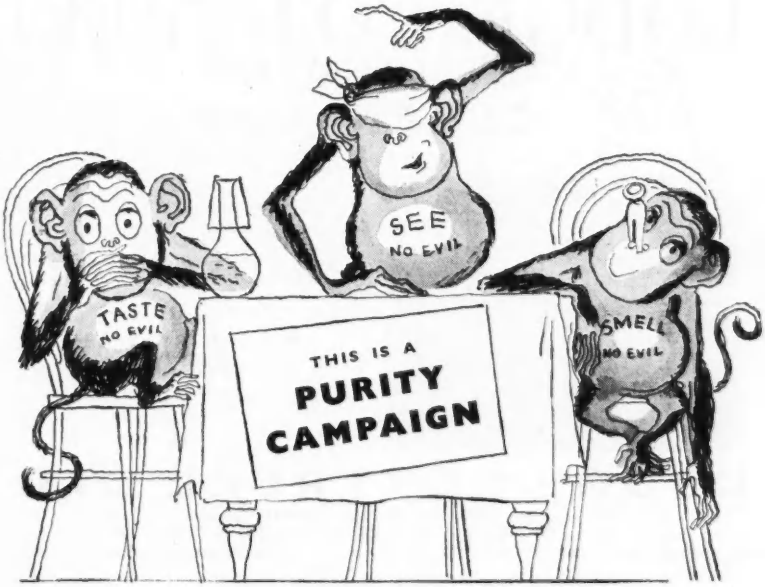

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A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Counter-Attack on Planning

THE overriding authority exercised by Government departments in the daily affairs and future plans of nearly every industry, three years after the lifting of war conditions removed the sanction for it, is bringing to life a new spirit of resistance. The novelty consists in the fact that, while the desire to throw off the myriad small incumbrances and major controls which continue to inhibit industrial expansion has always been active, current evidence of the pressing need for a spirit of opportunism in industry and of the conspicuous failure in many directions of State planning to match that need has injected a new urgency into industry's demand for elbow room and has given to the public demands a sharper note. The imminence of the Budget statement and the practical certainty that the preservation of an extravagant system of centralised control of buying, selling and allocation of men and materials will preclude the granting of any adequate relief to industry and to those who provide its cash resources appear to have hastened a challenge which will not easily be passed off.

Among an increasing number of expressions of exasperation two recent speakers have set out, respectively, the history of the development and preservation of industrial controls and the typical reaction of the industrialist. Sir Graham Cunningham has clarified the issue in the summary he gave at the recent meeting of the National Union of Manufacturers, as a supporter of the campaign being launched by the union to win back some scope for free enterprise. Economic planning, he recalled, derived from the war, when it was admittedly indispensable and most effective. Continued scarcities and the new need for a degree of economic integration among countries taking advantage of Marshall Aid afforded, in his view, some excuse for preserving the anachronism. As one of the Economic Planning Board which advises the Government, Sir Graham Cunningham is in a much better position than most others to realise the extent to which administrative action has been made somewhat more palatable by the occasional acceptance of informed industrial opinion, and partly because of that knowledge he is prepared to see the planning principle in a less harsh light than do those who know it only through its not infrequent absurdities and prohibitions. Yet, like all others who are intimately acquainted with the channels through which the life force of industries comes, he has no doubts about what would be the result if centralised authority replaced what is still the mainspring of all industrial expansion. He told the National Union of Manufacturers: "We see nationalisation already imposed in certain industries, threatened in others, and we say, as industrialists—'Yes, that is all very well, coal might have been inevitable; electricity, gas, transport, do not impinge upon us. I wonder if they will ever get

On Other Pages

through with steel—it will never happen to me.' Don't you believe it. Put it this way—it might happen to me and if it does happen to me where then will be Free Enterprise. What part will you play in it? We shall all be Civil Servants; we shall not be as admirable Civil Servants as those who for a lifetime had been trained to it. Shall we be as good Civil Servants as private citizens? I think not."

That represents the considered view of one well qualified and willing to see both sides of the present issue. Impartiality, even of that order, is not easily preserved under continued provocation, and most will find in themselves an even more cordial response to the summary of the sources of many present troubles offered by Mr. Cyril M. Cohen recording the experience of a wide ranging engineering organisation. He writes: "I am not overlooking that the process of 'tidying up the mess' after the war necessitated the prolongation of some controls, and having regard to the economic oddities—at least one hopes they are oddities—of the modern world, some measure of Government guidance in major policy is still unavoidable. But what is deplorable is that, in the fashionable name of 'planning,' the myriad edicts of the central authorities should have bred and multiplied to an extent which imposes a serious and undeniable handicap on industry and commerce.

"The unfortunate executive is bewildered. He literally does not know from day to day what he may do and what he may not do—and even to whom he should apply for refusal of permission to do it. His logical, apparently wise and certainly blameless decision of yesterday may well beget a crime against the State if translated into action to-day. . . . . Coupled with all this is his knowledge that if any profit were eventually to accrue to his company or himself from the action he had in mind, it would be so stricken with taxation as to leave precious little, either for that laudable 'ploughing back' which increases the fertility of businesses, or for depreciation charges. Human nature being what it is, can one be surprised if he sometimes takes the line of least resistance, and asks himself whether the game is worth the candle—or, perhaps I should say, diminutive and problematical carrot?"

All this elaborately engineered structure almost inevitably frustrates those who are chiefly responsible for it as much as it does industry. The planners themselves could probably enlist some sympathy in their endeavour to achieve the impossible. They are up against too many uncontrollables and unknowns, observes Mr. Cohen. All are capable of combining—and do—to make nonsense of the most cherished and seemingly infallible "planacea" mice or men can contrive.

NOTES AND COMMENTS

Radioactivity in Industry

THE commercial development of radioactivity, of which the scientific aspects have been, this week, the subject of a Chemical Society and Ministry of Supply symposium of unusual interest, is the preoccupation in the U.S.A. at the present, and American experience represents an interesting commentary on the possible course of industrial application here. While direct parallels cannot safely be drawn, there are stimulating possibilities from a commercial standpoint in the news that production of the new kinds of scientific apparatus called into being by the prospect of widened use of radioactive materials in science and industry has, in America, attained the status of a separate industry, said to be worth the equivalent of £2.5 million a year. This, bearing in mind that even in the U.S.A. the free use of radioisotopes in industry has still to be realised, is a powerful indication of the scope of profitable activity which will follow in the train of widened use of radiation techniques. This and a number of other pointers to the course of commercial developments were offered recently by the head of the isotopes division of the U.S. Atomic Energy Commission, Dr. Paul C. Albersold, to an audience of commercial chemists and chemical executives in New York. He left no room for doubt that the pace at which the usefulness of radioactive elements is being transformed from speculation to a commercial factor is far more rapid than any chemical development in the past. Radiocarbon 14, so far one of the most useful industrial tracers, was originally offered by the AEC at $376 per millicurie; to-day's price is $36. It is possible now to produce by nuclear bombardment several hundred radioactive forms of the newly enlarged range of known elements, all of which will require industrial equivalents of the laboratory's radioactivity detecting and measuring appliances.

Prospectors' Luck

THE Ministry of Supply's recent announcement of what it is prepared to offer to encourage the exploitation of uranium deposits (THE CHEMICAL AGE, *60*, 442) has raised an indignant protest from Mr. F. Llyde Caunter in a letter to the *Financial Times*. Uranium, he points out, occurs sporadically in the West of England and has never been intensively prospected. (The Ministry suggested that the prospects of new finds in the U.K. at this stage were not bright.) Since 1946, when a committee was set up to inquire into the metalliferous resources of the U.K., prospectors—claims Mr. Caunter—have been waiting for some sign of encouragement. And, when such a deposit was brought to its notice, after the passing of the Atomic Energy Act, the Ministry is now stated to have taken no steps to exploit it and to have prevented others from doing so. Now all were being urged to go out and seek uranium, but while capital was offered for the colonial prospectors to install plant, etc., no such favour appeared to be available to those in Britain. Reports this week indicated a find of uranium ore at a mine in Cobham, Kent, reviving hopes that there may be deposits elsewhere in England, but unless greater liberality is shown by the Ministry the home prospector may feel that the treasure hunt is not worth while, failing a very strong prospect of a large reward at the end of it. Meanwhile, the future of British metal mining is intimately tied up with the report of the Government Mineral Development Committee, whose findings, it is to be hoped, will be published at the earliest possible opportunity.

Improving Refractory Materials

THE attainment of new levels of efficiency in metal furnace technique is one of the more hopeful characteristics of recent news about the heavy industries. The new principles contained in one of the latest of our open-hearth steel furnaces, that of Richard Thomas & Baldwins, Ltd., at Scunthorpe (*page* 491, *this issue*) is an excellent example, admirably furthering two present essential needs—of equipment designed to withstand the greatly accelerated pace which contemporary steel making has set, and of home produced refractories helping to make this country independent of dolomitic and other imported material. A most interesting contributory factor in this work has been the use of seawater magnesia, and it is encouraging to note

that the Ministry of Supply has in this regard exhibited a creative and enterprising spirit not commonly associated with Government departments. Any contribution which makes more satisfactory supplies or performance of refractories is fit to be the subject for rejoicing in a sphere much wider than the metal industries. Some glass processes, for example, would be transformed from an economic standpoint, were kilns not so prone to break down under the exacting conditions of heat and stress, which so many modern industrial processes increasingly demand.

Indian Trade

NONE of the factors which form the variegated and not invariably repetitive pattern of United Kingdom overseas trade in chemicals is better worth study at the moment than the exchanges with the Dominion of India and, in a less degree, with Pakistan. Indications of the design for chemical industry which the authorities on the spot are elaborating for India have been given in the various reports, which we have summarised at frequent intervals, of the Dominion Government's industrial development committees, all of which aim at a very much enlarged production of chemical materials. Characteristic of nearly all such reports is the evident desire, regardless of certain very serious shortages—notably of plant, technically trained staff and operatives and transport—to render India a self supplier of many of the basic chemicals and some metals required for the great expansion of industries and agriculture. It is obvious that much pressure is being applied, especially by chemical producers in India, to persuade the industrial development committee to secure the raising of barriers against foreign produced chemicals on the plea that the Indian production would quickly expand to fill the gap at economic prices. Fortunately for the new Dominion, the development committee is not easily deluded about what would probably happen if India isolated herself from chemical supplies from the West. The pace at which some basic departments of Indian chemical industry is progressing towards maturity is, nevertheless, much more rapid than could have been foreseen; in the latest report, for example, it is estimated that home production of soda ash this year will be raised from the high total of over 28,000 tons attained in 1948 to 50,000 tons. The typical impediment, which is not peculiar to soda ash, is that the Indian price, said to have been reduced to the lowest possible economic level, still compares unfavourably with that of the larger stocks from overseas.

£5 Million Contracts

INDIA's best hope of supplying some of her essential needs, without inflating values and excluding competitive imports, is reflected by such projects as the Government fertiliser factory at Sindri, representing expenditure on the largest scale, not for chemicals but for plant and technology, which in relatively short time should enable the Dominion to produce annually 350,000 tons of sulphate of ammonia at competitive costs. (THE CHEMICAL AGE, *60*, 424.) The English and American participation in this is at once the prime essential and an assurance that the undertaking will have the benefit of all available technical advantages when it goes into production, probably next year. Against the view that this represents a short-sighted policy—of enabling an important purchasing region to dispense with at least some of the supplies it has been accustomed to receive from the United Kingdom—there are cogent arguments such as the immensity of the agricultural needs of India, which no single plant of this sort could supply and for which present British exports (3500 tons in February) are totally inadequate. The contract, meanwhile, is itself a very profitable factor in the overseas trade account. The Power-Gas Corporation, Ltd., of Stockton-on-Tees, which has been entrusted with the purchase of the plant and the provision of building services states that it has already procured orders in the United Kingdom in connection with the fertiliser scheme worth approximately £5 million. The share which has fallen to the U.S.A., for designing and fabricating the plant itself is equivalent to less than one-fifth of that sterling total and Indian contractors on the spot have secured about the same allocation.

Basle Fair.—The 33rd Swiss Industries Fair will be held at Basle from May 7 to 17, this year.

Chemical Plant Research

New Field for DSIR Study?

A PROJECT likely to have important results in chemical plant design was referred to briefly at the annual luncheon in London this week of the British Chemical Plant Manufacturers' Association.

The topic was introduced by the chairman, Mr. A. G. Grant, who, in proposing the toast of "The Guests," referred to the fact that until now there had been no organised co-operative plant research. If this were ever to be provided they could, he thought, not do better than take a leaf out of the book of Gas Research Board.

Mr. H. W. Cremer, president of the Institution of Chemical Engineers, who replied to the toast, said that important steps were now being taken by the Department of Scientific and Industrial Research to rectify the omission. It would be premature at this stage to say more.

"I have always considered," he said, "that chemical engineering is in general even more concerned with applied physics than with applied chemistry and I think that great strides have been made in recent years in awakening in the minds of physicists the realisation that we need them and they need us."

Revised Standards

TWO revised British Standards have just been issued by the British Standards Institution.

B.S. 391 : 1948 is a revision of two standards for tung oil, the first type F derived from *Alewrites Fordii* (B.S. 391 : 1936), and the second type M an emergency war revision issued in 1940 covering oil derived from *Aleurites Montana*. The present revision is intended to cover both species of oil and lays down the quality of the material by specifying the limits for volatile matter, colour, specific gravity, refractive index, iodine value, saponification value, acidity, unsaponifiable matter, gelation time, and insoluble bromide content.

The wall chart of identification colours for gas cylinders, B.S. 349c which was first published by the BSI in 1932, has been out of print for some time and a new edition, including all amendments is now available. The chart is available both mounted and unmounted.

New Quarry Products.—Experiments are being made to manufacture floor tiles from slate waste, it was reported to the North Wales District Committee of the Welsh Board of Industry at Bangor recently.

British Scientists in Nigeria

Jungle Test of Materials

MUCH useful research work is being carried out in Nigeria by a team of scientific experts from the Ministry of Supply, assisted by 200 Africans.

Members of the Ministry's tropical testing establishment, they are conducting investigations both in town headquarters and on jungle exposure sites to render materials and equipment resistant to tropical weather, insects, and fungi. Plastics, metals, optical equipment, electrical and building materials, and textiles are being submitted to severe tests.

Nigeria was chosen for the work as it affords a complete range of tropical climatic conditions. Modern buildings, proofed against insects are to be built shortly to replace the shakedowns with glass roofs, which have been in use since the war.

HEXANE FATALITIES

AT an inquest at Wealdstone last week on the death of two women due to an explosion in a chemical works at Pinner (THE CHEMICAL AGE, *60*, 381), the jury found that the management was at fault in not taking better precautions for the safety of the employees.

The accident was due to the breaking of a bottle of leather dressing fluid containing hexane, the vapour from which exploded on coming into contact with a gas fire.

When the explosion occurred, according to one witness, Mrs. Edward, a forewoman who afterwards died, had to run back through the blazing room to get out, as a door leading from a cloakroom into a yard was locked.

The manager of the works, Mr. James Brooks, said that he was not at the factory on the day the accident occurred. Had he seen a carboy was out of its iron cage, he would most certainly have taken steps to see that the gas radiator was not alight, as this was not allowed to be on during the decanting of inflammable material.

He did not realise that all doors should have been left open for easy exit, neither was he aware that before inflammable materials were used a certificate should have been obtained to show that there was adequate means of escape.

Lead Development.—Weardale Rural Council is submitting to the Ministry of Town and Country Planning an application by the Weardale Lead Co., for a development permit covering the whole of its mining rights in the Weardale area.

GLYCERINE REFINING

New Method of Purification and Concentration

THE purpose of an invention which forms the subject of an English patent application[1] by the Nopco Chemical Company, is to refine the crude glycerine produced by saponification and the more recent alkyl esterification methods.

In a co-pending application[2], the applicants claim an improved process for preparing alkyl esters of fatty acids. This comprises, first, transesterifying fatty glyceride material with low molecular weight alcohol in the presence of alkaline material to neutralise free fatty acids, and serve as alkali catalyst; secondly, adding sulphuric or phosphoric acid to the split soaps previously formed, neutralising the alkaline catalyst, and serving as an acid esterification catalyst and finally, esterifying the remaining free fatty acids with alcohol.

Separation and Purification

Briefly, the present invention consists in separating the acidic glycerine from the esterification mass, neutralising with alkaline earth oxide or hydroxide, heating the neutralised glycerine with an ammonium halide (*e.g.*, chloride), and removing the insolubles. Neutralising the alkali may be effected before separating the glycerine.

The refined and substantially anhydrous glycerine may be further purified by distillation, co-distillation with mineral oil, or by solvent extraction, or a combination of these. A theoretical explanation of the reactions involved is given, together with numerous examples, of which the following is one.

Nine hundred parts of groundnut oil of acid value 1 were reacted with methanol in the ratio of 15 molecules of methanol to one molecule of glyceride, with 1 per cent sodium hydroxide as alkaline catalyst. The mixture was refluxed for an hour, cooled, acidified with 20.2 parts of concentrated sulphuric acid, and refluxed for another four hours.

The reaction mixture separated into layers and the lower glycerine layer was drawn off; 38 parts of barium oxide were added to the glycerine layer and the mixture heated for an hour on the steam bath. It was then cooled, 29.5 parts of ammonium chloride added, and further heated for an hour.

Most of the methanol associated with the glycerine was then distilled off and the reaction mass filtered. The crude glycerine obtained was distilled under reduced pressure, yielding an odourless, water-white anhydrous glycerine of *p*H 7 in 83.7 per cent yield.

Alternative Method

The second method described in the patent application is similar. The crude anhydrous glycerine was first neutralised with calcium or other appropriate carbonate or mixture, either before or after the removal of glycerine from the mass, and the insoluble material removed by filtration. The glycerine may be heated for a short time, at about 60°C. for 30 min. on the steam bath, to aid the conversion of insolubles into a form more readily filtered.

An alkaline earth halide, *e.g.*, barium chloride, is added and more alcohol to increase fluidity. This eases handling and prevents loss of glycerine, if sufficient alcohol is not left from the esterifying stage. After these additions, the mass is again heated at 60-120°C. for 30-60 min., *i.e.*, at the reflux temperature of the alcohol. Insolubles are again removed by filtration and any residual alcohol is distilled off.

Solvent removal of impurities may be also adopted, preferably at room temperature, or the glycerine may be completely dissolved in an alcohol and acetone added to precipitate impurities; and centrifuging may also be used. The mass is digested by further heating for about 30 min. at 50-60°C.

[1] Eng. Pat. 21059-60. Conv. date 15/8/47.
[2] 19813/1941.

RECORD IN JAPAN

Production, distribution and utilisation of fertilisers continue to be problems in Japan although the Office of International Trade of the U.S. Department of Commerce reports steady progress in the last three years. Production of refined soda ash reached a post-war record of 8557 metric tons in September, 1948, compared with 3576 metric tons in September, 1947, according to reports of the Japanese Ministry of Commerce and Industry. Output of caustic soda rose to 12,262 tons in November.

SCIENCE ABSTRACTING

AN International Conference on Science Abstracting is to be held in Paris from June 20-25 by the United Nations Educational, Scientific and Cultural Organisation. The purpose is to improve abstracting services for the natural sciences, both pure and applied, and to consider methods of increasing the usefulness of abstracts to scientists, particularly with regard to indexing and accessibility of publications. Each Unesco and UN Member State will be entitled to nominate three delegates.

PROGRESSIVE POLICY IN GERMANY

New Impetus for Chemicals, Oil, Rayon and Aluminium

WITH the Ruhr coal production up to over 330,000 metric tons a day, fuel supplies to German industry are steadily improving, but temporary shortages are still interfering with operations in some chemicals-consuming industries, for instance in the cellulose and paper factories. The first coke deliveries were made at the middle of March by the big coke-oven plant of the Watenstedt-Saltzgitter iron and steel factory, the former "Goering" works, and coke, gas and by-product supplies from other coke-oven plants are also increasing.

Chlorbetriebe Rheinfelden, A.G., the company which took over the electro-chemical works of I. G. Farbenindustrie at Rheinfelden, in the French occupation zone, is now operating under predominantly French management. The production includes caustic soda, liquid chlorine, vinyl chloride and chloride solvents. French industrial interests are particularly interested in the latter products.

Rheinische Zellwolle, A.G., Siegburg, reports that full employment has been possible as a result of the importation of cellulose from Canada, and it is hoped to produce over 80 tons of staple fibre a day. The company is one of the most important producers of artificial fibres in Germany.

Perlon Progress

The production of perlon in the Obernburg plant of Vereinigte Glanzstoff-Fabriken, A.G., has not yet progressed beyond the experimental stage, but is expected to do so in the course of this year. Meanwhile, a Berlin firm, Acetat-Kunstseidenfabrik, of Berlin-Lichtenberg, which formerly belonged to the I.G. Farben combine, has begun the production of perlon bristles.

The German crude oil output declined in February to 56,666 metric tons, compared with 58,472 tons in January, but the daily production of over 2,000 tons is higher than any since the end of the war.

Plans are afoot in the mineral oil industry for the erection of a tetra-ethyl lead plant in Western Germany. The need for an anti-knock component is greater now than it was before the war because Western Germany can no longer draw on the surplus potato spirit of the eastern provinces and benzol is largely reserved for chemical use. The three tetra-ethyl lead plants—at Gapel, Frose (Anhalt) and Heydebreck (Upper Silesia)—are all under Russian control and said to have been dismantled.

Reports from Western Germany state that the Vereinigte Aluminiumwerke, in Tögling, is at present the only aluminium plant in operation in that sector. Under normal conditions, this plant can produce about 38,000 tons per annum, but as a result of insufficient supplies of electric power output fell from about 2000 tons last September to only 180 tons in March. Towards the end of last year aluminium was imported from Italy, and it is hoped this year to obtain supplies also from Switzerland. It is, however, not likely that aluminium will arrive from either the U.S.A. or Canada. The aluminium plant at Lunen, near Düsseldorf, has been scheduled to resume operations but work has not yet started. When in full operation, this plant could produce 900 tons of virgin aluminium per annum.

GERMAN TECHNICAL REPORTS

AMONG the latest reports on German industry, obtainable from H.M. Stationery Office, are the following:—

BIOS 1780. Some aspects of the German glass industry in 1946 (8s.).

BIOS 1827. Safety fuse manufacture in Germany (10s.).

BIOS 1829. The manufacture of borax, boric acid and sodium perborate in the Western Zones of Germany (3s. 6d.).

BIOS 1854. Interrogation of Dr. Reiner Chelius of Fried Krupp, A.G. Essen, on March 16, 1948, with the analysis of synthetic carbide materials and components used in their manufacture (4s. 6d.).

BIOS 1854. German resistance welding equipment and developments (4s. 6d.).

BIOS 1859. Interrogation of Dr. Gerhard Hinz (Schering A.G. Berlin) at Spedon Towers, Hampstead. Manufacture of cellulose triacetate, yarn and film (5s. 6d.).

FIAT 755. Highlights of German iron and steel production technology (12s.).

FIAT 952. High pressure hydrogenation in Germany (22s. 6d.).

Classified list No. 18. Consolidated list under subject headings of all reports on German and Japanese industry published up to and including March 31, 1948 (1s.).

Classified list No. 19. Reports published between April 1 and August 31, 1948 (2d.).

International Foundry Congress.—The 1949 International Foundry Congress is to take place at Amsterdam from August 29 to September 2.

Production of Chemicals in Canada

Highest Peace-Time Level Reached in 1948

From Our Own Correspondent

THE value of the output from the chemical and allied industries in Canada during 1947 totalled $450 million compared with $376 million in 1946, reports the Dominion Bureau of Statistics in its final summary of the industry, just released. The 1947 value was the highest attained in any peace-time year, and if shell filling were excluded it was greater also than the total value for this group in any of the war years.

Higher Prices

Apparently the 20 per cent increase in value was due chiefly to advances in prices for chemicals and chemical products. The volume index for the chemical group indicates a gain of 6 per cent, and the index of employment was up only 2 per cent from 1946, but the index of wholesale prices advanced 13 per cent. It appears that about one-third of the gain in 1947 was due to greater volume of production, while two-thirds of the advance was due to the higher prices realised.

In 1947 there were substantial increases in output in 10 of the 12 industries into which the group has been divided for statistical purposes. The percentage gains were as follows: coal tar distillation, 11.6; heavy chemicals, 25.4; compressed gas, 15.6; fertilisers, 17.6; paints and varnishes, 23.2; soaps and cleaning preparations, 39.0; miscellaneous, 85.6; inks, 12.5; adhesives, 9.3; and medicinals, 4.8.

The toilet preparations industry showed a decline of 16.5 per cent and output from the polishes industry decreased by 8.6 per cent. The plastics moulding and fabricating industry was taken out of the chemical group in 1947, but this loss was offset by the inclusion of the synthetic rubber industry.

In 1947 there were 1031 establishments making chemicals and allied products, with a monthly average of 38,491 workers employed. About $205 million were expended by the industry during the year on materials for manufacturing $16 million for fuel and power, and $77 million for labour. The 530 works in Ontario accounted for 55 per cent of the production, and the 334 establishments in Quebec accounted for 31 per cent.

The value of imports into Canada, in 1947, of chemicals and allied products was the highest on record at $113 million, an increase of 22 per cent from 1946 and nearly three times the pre-war total of $43.7 million in 1939. About 88.6 per cent of the imports in 1947 were from the U.S.A. and 5.6 per cent from Great Britain.

The value of Canadian chemical exports in 1947 was $83 million, which was 24 per cent greater than in 1946 but considerably below the total of $113.3 in 1945. Canada's chemical products went to almost every country in the world. The United States, which took 38 per cent of the total, was the best customer, and the United Kingdom, which took 9.7 per cent, was the second. About 5 per cent went to China and 3 per cent each to France, British India, the Netherlands, British South Africa, Newfoundland and Hawaii.

Growing Availability of Hydro-Electric Power

HYDRO-ELECTRIC construction in Canada was very active during 1948, over 400,000 hp being added to the generating capacity of the country to bring the total hydraulic installation to nearly 11 million hp. The increases in capacity, involving 278,000 hp in 11 new plants and 161,395 hp in extensions to eight existing stations, are well distributed across the Dominion. Many developments also are in various stages of active construction, while others are planned or are under investigation; it is estimated that over 2 million hp will be added to productive capacity during the next few years.

Power consumption, in addition to the railways and public utility undertakings, was by a number of industrial concerns, among which investigations by the Aluminium Company of Canada of high-head sites of large capacity in the vicinity of Bute Inlet were carried out during the year.

The Consolidated Mining and Smelting Company has work underway at its Brilliant Plant on the Kootenay River towards the installation of a third unit of 37,000 hp to be in operation in 1949. Also scheduled for early operation is a new unit of 6750 hp in the City of Nelson plant at Upper Bonnington Falls, Kootenay River, states the annual review of water-power development and hydro-electric distribution in Canada, which has been issued by the Dominion Water and Power Bureau.

Ammonium Thiocyanate Recovery

Developments Stimulated by Plastics Demand

From a Special Correspondent

THE possibility of increased demand for thiocyanates for the production of amino-plastics, developed since the war, is likely to create a fresh outlet for this by-product from gas manufacture. In the past, demand was derived mainly from a limited number of calico printing and dyeing processes, photographic fixing, submarine paint production, and certain electro-plating processes.

The ammonium salt, which is familiarly recovered from the gas water, or from the purification residue (iron ore) still remains the most widely used compound, and is generally the basis from which the other commodities are prepared. Ammonia wash liquor from the gas works usually contains from 0.2 to 0.3 per cent ammonium thiocyanate.

The liquid which oozes out from the oxide boxes, however, can contain anything from 20 to 30 per cent of this salt together with from 2.5 to 3 per cent of iron thiocyanate. Where lime is used for purifying the gas, the calcium salt is leached out, but it contains also calcium thiosulphates, from which it has to be separated by evaporation. It has the advantage, however, of usually being free from iron contamination.

One American patent protects a system of successive scrubbing in scrubbers which must all contain sulphur, and by an arrangement of re-cycling, permits a strong ammonium thiocyanate solution to be drawn off from time to time.

Several other patents cover methods of substituting magnesium compounds, such as magnesium sulphide, or emulsions of magnesia, or magnesium carbonate, to treat the gas which has been freed from tar and ammonia, or for more direct application.

Specialised Filter

A number of small improvements have been made in the method of recovering ammonium thiocyanate from the liquors from oxide boxes, of which the following is a successful example.

Each 100 gal. of liquor is treated with 4 gal. of ammonium sulphide containing about 25 per cent NH_2S. The temperature is maintained at not more than about 30° C. and thorough stirring is performed before filtering.

The dark precipitate of iron sulphide is difficult to filter rapidly unless special precautions are taken, as a close examination will reveal that particles of the sulphide pass through the filter cloth. A vacuum filter with ceramic filter plate will do the job very thoroughly, but tends to be a slow process.

Because of these difficulties, a special design of rotary vacuum filter was constructed by Maschinenfabrik Imperial, of Meissen, which renders it possible to filter a great variety of different sludges with comparative rapidity.

Unlike other rotary vacuum filters, the drum of the apparatus, which revolves in the liquor containing the precipitate, is made up of a number of different segments or zones. The first of these is represented by the normal suction zone where the sludge is sucked against the cloth which surrounds the drum. The next zone is the de-watering, and washing zone, and is followed by the cake-removal zone which makes use of a novel principle.

Removing the Precipitate

Instead of the cake being scraped off, which can rarely be done effectively without risk of impairing the surface of the underlying cloth, the suction from the compressor is applied in the reverse direction. The cloth, although otherwise tightly held, is thrust outward by the air pressure. This loosens the cake, a form of cord-brush, and rotating independently in a spiral manner over the surface, removes the precipitate, while exerting the minimum of abrasive action on the surface of the cloth.

In the final zone of the filter drum, the cloth is cleaned by water-spray, and it then returns to the first zone with the pores in almost perfect condition for taking up more precipitate. By this method, precipitates such as iron sulphide, which normally are difficult to filter rapidly, are dealt with comparatively easily.

The filtrate is evaporated directly in aluminium pans, and allowed to cool to permit the ammonium sulphate to crystallise out. Where the boiling point is raised to 122° C. the separation of ammonium sulphase is claimed to be almost complete, as a test with barium chloride will reveal. From each gallon of liquor treated, anything up to 1 lb. of ammonium sulphate will be recovered.

Crystallising and Testing

The remaining solution can yield a recovery of up to 95 per cent of the total content of ammonium thiocyanate in the original liquor. This is recovered by boiling

Heat Disposal in Nuclear Fission

U.S.A. to Use Liquid Metal

THE experimental atomic power plant now under construction near West Milton, New York, will use liquid metal to transfer heat created by atomic fission to the heat-exchanger, where steam will be produced to drive steam turbine generators.

Higher Energy

This new fact about the installation, which the (U.S.) General Electric Company will operate for the Atomic Energy Commission, has been revealed by Dr. Robert F. Bacher, the only physicist member of the Commission, who also disclosed that the reactor in the new plant will differ from most previous reactors in the higher energy of the operative neutrons which are produced in it by chain reaction in uranium.

"The energy set free by a chain reaction is liberated very close to the place where each nuclear fission takes place and appears as an intense local heating," Dr. Bacher explained. "The problem of utilising this energy efficiently is one of the reactor development problems. Either to use this energy or simply to dispose of it, it must be removed by some heat transfer agent. In the reactors built during the war the heat energy was removed by circulating air or water and the heat really was wasted.

"These wartime reactors were constructed because they could be used to produce a new element—plutonium. This new element is produced by the action of the reactor neutrons on the main part of the natural uranium which is uranium of mass 238."

Excepting the experimental research reactor at the Los Alamos Laboratory in New Mexico, which uses plutonium as a fuel, the reactors at the Hanford Works in Washington, and all others built so far, slow the neutrons until they have very low or "thermal" energies.

Dr. Bacher referred to the machine now being designed and planned for construction by the Knolls Atomic Power Laboratory as an intermediate reactor—one which operated with neutrons of intermediate energy. So far, no reactor has been built to operate in this intermediate energy region. It is in this that the heat energy will be removed by circulating a liquid metal and it is planned to utilise the heat to generate electrical energy. It is also planned to test the possibility of breeding new fissionable material with intermediate energy neutrons.

Four New Reactors

The West Milton reactor is one of four of new types which are being built under the sponsorship of the Atomic Energy Commission. Others, he said, are:

1. A materials testing reactor which, as its name indicates, will be used in the study of materials to be employed in building reactors.

2. A Navy reactor designed as a land-based prototype of a reactor for use in propelling naval vessels of appropriate types.

AMMONIUM THIOCYANATE RECOVERY

(*Continued from page 481*)

the liquor at temperatures up to 140° C., cooling, removing the crystals, and collecting them in a centrifuge equipped with basket of aluminium wire mesh.

The same evaporation process is repeated several times until the majority of the thiocyanate has been recovered, when samples are removed and tested for purity.

What remains comprises a form of slimy matter, and is not readily crystallisable. This, however, rarely exceeds 5 per cent of the total. For laboratory purposes, a re-crystallisation of the product is necessary, and is done simply by dissolving the crystals and again evaporating.

Since the war, it has been the practice to subject some of the thiocyanate so obtained to careful heating to some 170° C. which by isomerisation converts an appreciable amount of it (about 42 per cent) to thiocarbamide, which is the basis for a number of patented synthetic resins.

This introduces an outlet for thiocyanate for which demand was very limited in the past. Now the demand for plastics is continually growing.

Commercial process in Darmstadt uses exacting methods for ascertaining the purity of ammonium thiocyanate; on ignition in a platinum crucible, 2 grams of the crystals must leave no residue which can be weighed.

The solution 1 in 20, is placed in long tubes of clear glass held over white paper, and should show no brownish coloration on addition of ammonium sulphide, or change of any kind after addition of barium chloride, after standing 5 minutes. This reveals the presence of any trace of heavy metals or sulphates.

The pure re-crystallised salt on addition of 1 c.c. of pure hydrochloric acid in 10 c.c. of water should leave the solution absolutely colourless, with no tendency to exhibit a pink tint.

American Expanded Glass

Useful Properties Claimed

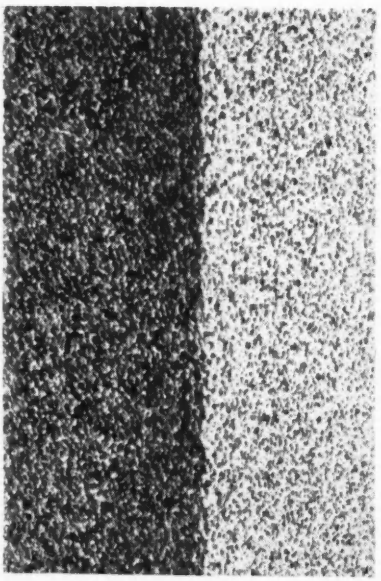
A NEW type of opaque glass for which many industrial uses are expected has recently been produced by the American Pittsburg Corning Corporation.

This—Foamglas—is produced by firing ordinary glass which has been mixed with a small quantity of pure carbon. At a certain temperature the glass softens and the carbon gasifies to produce globular cells.

By proper selection of the glass batch, the type of carbon, and by exact control of times and temperatures, it is possible to obtain rigid vitreous slabs of the new glass in which the cells are uniformly small in size and entirely sealed from one another.

Foamglas has valuable insulating qualities, is odourless and fireproof. It has a weight of only 10 lb. per cu. ft.—about one-fifteenth that of ordinary glass. It is claimed that it will float and can be sawn or drilled with ordinary tools.

Investigations are being conducted as to the possible employment of the new material as an alternative for cork, balsa wood, cellular rubber and kapok.



Yet another glass application—this time as fireproof insulating material, opaque and lighter than most woods

Synthetic Drying Oils

Rapid Production of Stable Material

SOME important improvements are reported to have been effected in the U.S.A. in methods for the production of synthetic drying oils, more particularly as reaction products of a polyvinyl alcohol with unsaturated fatty acids, yielding quickly firm and stable films of great durability. Indications of these are contained in the English patent application (No. 6040/1947) of the Hercules Powder Company. The polyvinyl alcohol is esterified with an unsaturated fatty acid of at least 14 C atoms by heating in mutual solvent at a temperature of 170-235°C. Several examples are given, of which the following is one:—

Eight hundred parts of phenol and 88 parts of polyvinyl alcohol (Du Pont RH 393 low viscosity type B) are mixed in a vessel equipped with stirrer, thermometer, and distilling arm for refluxing or distilling phenol, and heated to 160°C. to form clear homogeneous solution; 700 parts dehydrated castor oil fatty acids are then slowly added to avoid turbidity, and the temperature is slowly raised to 185°C., when phenol begins to distil. The solution must remain clear.

At the end of four hours all the fatty acids have been added and 750 parts phenol and water recovered, the temperature reaching 235°C. Esterification is continued for a further 2½ hours at 235°C., using CO_2 sparge. The ester residue is extracted five times with equal volumes ethyl alcohol. The yield was 358 parts ester with acid No. 18 and saponification No. 170.

Use may be made of a fatty acid mixture obtained by hydrolysis of linseed, dehydrated castor, soya bean, tung, or other oil, and the reaction product may have acid No. 80-110; also it may be contacted with material in which it is insoluble but which may dissolve out excess drying oil fatty acid associated with product. An anti-oxidant may be included, also drier, and a resin gum.

Rubber Production Record

A record output of 696,978 tons of rubber was attained in the Federation of Malaya during 1948, showing an increase of 50,000 tons over the previous year. It is believed that this new high figure represents the maximum production that can be obtained from the territory. Exports from the Federation during 1948 reached 979,000 tons, which exceeded the totals for 1947 by 25,000 tons.

Statistics made available to the Rubber Study Group showed that rubber consumption in Czechoslovakia for the first ten months of last year was 21,189 tons, compared with approximately 10,000 tons annually before the war.

Pyrethrum Substitutes

U.S. Claims Effective Synthetics

INTENSIVE studies during the past 15 years by a U.S. government chemist, F. B. LaForge and his associates, is stated to have resulted in the synthetic production of new pyrethrum-like chemicals that kill insects. The work was carried out in the laboratories of the Bureau of Entomology and Plant Quarantine.

The chemical make-up of the synthetic materials is stated by the chemists concerned to be identical with that of the insect-killing principle in pyrethrum.

The new discovery may be the beginning of the development of a means through chemistry of providing a material which has wide importance in insect control. "Much still needs to be done,' states the U.S. Department of Agriculture, "before it can be produced in quantities sufficient to appraise its usefulness fully. Many things remain to be learned before it can be produced commercially." One of the compounds, tested in the Bureau's laboratories at Beltsville, Maryland, was said to be six times as toxic to house flies as the combined toxic principles of pyrethrum flowers. All are said to have the same desirable quality of quick "knock-down" action.

The chemical make-up of the materials indicates that they will not break down quickly natural material. Furthermore, it appears that the toxicity to higher animals will be found to be of about the same low degree as that of the plant product.

In recent years U.S. imports of natural pyrethrum have come chiefly from the Kenya Colony and the Belgian Congo. As much as 20 million lb. of pyrethrum flowers have been imported in one year. In recent years American imports of pyrethrum have declined because of the comparatively low cost of recently developed synthetic organic insecticides. During the war practically all pyrethrum went into insecticides for the armed services and it was the principal insect killer in the 35 million aerosol bombs which helped protect U.S. armed forces from malaria and other insect-borne diseases.

Poisonous Salt Substitute.—The U.S. Federal Food and Drug Administration is taking drastic steps to prevent the further distribution of certain salt substitutes, as proprietary preparation and as an ingredient of bread for those ordered a salt-free diet, because they contain lithium chloride. The toxic constituent is already reported to have caused three deaths.

Artificial Chloromycetin

Woman Scientist's Achievement

ARTIFICIAL production of chloromycetin—one of the most effective drugs for combating a variety of diseases—has been achieved for the first time on a practical scale by Parke, Davis & Co., of Detroit, U.S.A. A current report says that chloromycetin has been tested by the U.S. Army Medical Corps and found to be effective in cases where even penicillin and streptomycin have been unavailing. These include epidemic typhus, typhoid fever, undulant fever, infections of the urinary tract, and some bacillary dysenteries. It has also been successful in animal tests against organisms that cause whooping cough, virus pneumonia, parrot fever (psittacosis), scrub and murine typhus, rickettsial pox, and lymphogranuloma virus.

Dr. Mildred C. Rebstock, a 28-year-old woman scientist on the firm's research staff, first synthesised an active form of chloromycetin. A second method of making it on a commercial scale was later developed by Dr. Loren M. Long and Dr. Harvey Troutman.

Research scientists in the course of the synthesis isolated for the first time a natural compound containing a nitro-benzene grouping of a kind assumed to be harmful to animal life, but now as part of the antibiotic found to be harmless. The drug was also found to be a derivative of dichloracetic acid, another chemical not previously found in a natural product.

Currentless Fluorescent Bulb

AN ingenious adaptation of the fluorescent lighting principle in a form promising fruitful uses as a recording device which dispenses with electric current is the subject of a patent granted in the U.S.A. to the Duro Test Corporation.

Chemical and Engineering News relates that the light consists entirely of a bulb that can be produced in any colour or shape. The interior of the bulb is coated with any suitable fluorescent material, as for instance zinc silicate. Then a small quantity of rare gas such as neon or argon is introduced, plus a small globule of mercury. The fluorescent material may be either in the form of a coating or as loose powder.

Other suitable coating materials with fluorescence and colour are zinc beryllium silicate or calcium tungstate. The combination of liquid mercury and phosphor particles in atmosphere of rare gas at low pressure are the ingredients currently used in fluorescent light. When agitated or shaken these combine and produce light.

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PROSPECTS FOR NON-FERROUS METALS

An American Survey

THE long deferred decline in world prices of lead—which fell last week to 17 cents per lb.—and signs of weakness of copper scrap in New York—with which soon may be associated a similar decline in copper prices—have been followed sooner than was expected by a drop in the price of U.S. zinc. An East St. Louis quotation last week reflected a reduction of 1.5 cents to 16 per cents per lb. for zinc.

A reduction of 1½ cents to 15¾ cents per lb. for prime Western zinc was announced by the Consolidated Mining and Smelting Co. of Canada. This was the first post-war decrease and followed the general lowering of price in the U.S.A. Consumption of zinc has fallen slightly in the U.S.A. in response to the reduction of output of the brass trade, which in turn has affected the industrial demand for copper. Attention in the U.S.A. and here is focused with interest on the prospects of further changes—and their effect upon world prices.

An appraisal of America's position was given recently in a paper to the Metal Convention of the American Mining Congress at San Francisco by Simon D. Strauss, in which he took a perspective view of the past 13 years and examined the major trends of the non-ferrous metal industry.

The U.S.A. he recalled, had for more than 30 years been the world's largest mine producer of copper, lead and zinc. The U.S. Bureau of Mines, after a careful survey of the known reserves of home copper, lead and zinc, estimated that these were adequate to maintain production for 15 to 20 years at current rates.

These estimates caused some uninformed analysts to conclude that the domestic non-ferrous metals industry, which first attained large volume a century ago, is doomed to early extinction.

Reserves

At no time, however, had known reserves of copper, lead and zinc been measurably greater than at present. It was obvious that they could develop additional reserves with time, although future discoveries presumably would largely be the result of new methods of prospecting, rather than the development of surface outcrops. In the last 20 years, furthermore, the bulk of the new ore developed had been in established districts rather than in new areas.

In the 1936-38 period the United States was an exporter of copper, an importer of lead, and was roughly self-sufficient in zinc production. In the 1946-48 period it was a large importer of all three metals. This pronounced change in self-sufficiency, however, was not due to a drop in production. The reason was that consumption has risen to an amazing degree—by 100 per cent in copper, by 50 per cent in zinc, and by 40 per cent in lead.

Foreign Producers

There was a feeling among some mining men that if the Government would only cease pampering foreign producers of metals and extend to our own industry necessary assistance in the form of tariffs, or subsidies, or loans, the mines of the United States could very readily produce all the metal that this country needed. This was, however, a much larger order than apparently is generally realised. It meant an expansion in effective capacity of about 50 per cent each in copper and zinc and of 75 per cent in lead.

Increases of this magnitude required not only enormous new ore developments and large amounts of capital, but a great deal of time as well.

It followed that if the consumers of this country continued to demand metals at anything like the present rates, we should continue to be net importers of copper, lead and zinc in large volume for five years or more. A statement of the prospects for the industry thus narrowed down quite largely to this question of the rate of demand. If demand was maintained then all the available and potential capacity of the domestic mining industry could be fully utilised.

One of the things that was bothering the United States mines was the fear that the extraordinary level of consuming demand in the last three years represented solely the satisfaction of wants pent-up during the war

when civilian production was limited to the bare essentials. Once these deferred wants were satisfied, might not consumption of metals and business activity generally fall back to pre war levels?

It would be foolish indeed to argue to-day that the current high rate of metal consumption was likely to be maintained indefinitely; it would not. A decline from the present level was to be expected; it was as probable as any future economic development could be.

But, while there would continue to be fluctuations, both upward and downward, in the demand for metals, it was probably true that the average of that demand would be considerably higher in the decade that lies ahead than it was in either the 'twenties or the 'thirties. There were several factors that made this so.

Capital Facilities

First, the population of this country was increasing by more than 1 per cent per annum currently, and had risen by more than 10 per cent since the 1936-1938 period. Furthermore, the distribution of the population was changing markedly. The Pacific Coast, the Gulf Coast, and the central Atlantic States were increasing in population much more rapidly than the country as a whole. This meant that in those areas new capital facilities—residences, public utilities, local transportation equipment, shopping and service centres—must be provided on a very large scale.

Second, the trend towards mechanisation continued. This can be measured in terms of electricity production by power plants, which has more than doubled between the 1936-38 period and the 1946-48 period. The more mechanised a country became, the higher the level of the normal replacement and repair demand for metals.

Third, the principle of stockpiling of strategic materials appeared now to be widely accepted; it should exertt a major influence in demand for metals for many years.

So much for the long-range trend of metals demanded. But were we, after three years of abnormally high consumption, standing to-day on the tthreshold of one of the inevitable dips in the curve?

It did not seem so. Public utilities, construction and transportation equipment were the principal consumers of non-ferrous metals. In each of these industries there were still pronounced shortages. While higher prices had tended to slow down the rate of new investment in additional utility capacity and in new plant facilities, there could be little doubt that a large core of unsatisfied demand remained.

Turning to the position outside the U.S.A., the speaker showed that consumption of metals had decreased between the 1936-38 and 1946-48 periods. Data on production and consumption of Germany and Japan and other enemy countries was not complete for the period.

No figures were available for Russia and little for its satellites, but this hardly affected the markets as they were barely participating in the international trade of non-ferrous metals.

European consumers to-day appeared to be more price-conscious than those in the U.S.A.

European Consumption

Over the longer term, however, a gradual revival in European consumption of metals was probable, assuming that war or its equivalent was avoided.

In fact, one of the more satisfactory aspects of the outlook for non-ferrous metals was the probability that about the time shortages in the United States might be expected to end, European requirements should be increasing, thereby absorbing the tonnages of foreign metals which at present were being imported into the U.S.A.

AUSTRIA'S STEEL

AUSTRIA'S 1948 steel output of 648,181 metric tons almost equalled the pre-war figure (650,000 tons in 1937). Output rose from 47,039 tons in January, 1948, to a peak of 62,332 tons in July, and declined, as a result of the power shortage, to 38,343 tons in December. For the first six months of the current year, steel output is expected to remain at its present level, but an increase by 40,000 tons is planned for the second half.

Pig iron output in Austria last year of 613,236 metric tons was almost twice as large as that of 1937 (387,000 metric tons). It rose from 40,835 tons in January to 60,204 tons in the peak of December.

World's Purest Aluminium

The purest aluminium in the world is now being produced by the Vigoland aluminium plant in Southern Norway, according to the Royal Norwegian Information Bureau. It is 99.996 per cent pure and so soft that it can be rolled into thin sheets, like tinfoil. It is expected to find many uses in industry and for consumer goods. This Autumn production should be at the rate of 600 tons p.a.

Heat Control of Aluminium Furnaces

Features of U.S. Automatic Regulation

BATCH furnaces for melting aluminium can now be brought to the required temperature quickly and accurately by means of a recently modified duration-adjusting type of electric control, according to an announcement by the Leeds and Northrup Company, Philadelphia, Pa., U.S.A. This equipment is said to improve the quality of castings by preventing gas inclusions and blow-holes, through limiting high-temperature swings which cause excessive formation of dross and absorption of gases. By bringing the melt to the correct superheat for pouring, the equipment is also claimed to provide better control of shrinkage, and closer dimensional tolerances for castings.

To avoid over-heating in bringing furnaces to temperature safely at the maximum heating rate—a common operating problem—the controller automatically turns off the fuel supply at a predetermined point so that the charge comes smoothly to pouring temperature. If necessary, it also holds the charge accurately at pouring temperature as long as desired.

The equipment used for this application is the duration-adjusting type (DAT) of the Leeds and Northrup's electric control. Instead of throttling the fuel valve, DAT alternately turns the fuel from "full on" to "full off." By controlling the durations of on-time, DAT supplies the heat input needed to balance the heat demand of the furnace, and thus hold the temperature at the desired value. In addition, the control instrument operates a set of lights which attract the attention of the furnace operator when fluxing and pouring temperatures are reached.

Production and Stocks of Non-Ferrous Metals

THE following particulars of production, stocks, consumption, imports and exports of non-ferrous metals in the United Kingdom in February are extracted from the monthly figures supplied by the British Bureau of Non-Ferrous Metal Statistics.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers' ...	33,698	81,650
Imports into U.K.	3,500	12,058
PRODUCTION:		
Primary	—	11,248
Secondary	1,688	6,328
CONSUMPTION:		
Primary	13,343	29,633
Secondary	—	12,405
EXPORTS FROM U.K.	1,324	—
CLOSING STOCKS:		
Govt. and consumers'	25,755	79,377

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	25,863 long tons
Alloyed copper products	22,710 " "
Copper sulphate	4,055 " "

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	17,579	39,929
Imports	1,755	9,779
PRODUCTION:		
Virgin and remelted	—	5,037
CONSUMPTION:		
Virgin (incl. debased)	6,323	16,893
Remelted and scrap	—	6,717
EXPORTS...	—	19
CLOSING STOCKS:		
Govt. and consumers'	13,011	39,805

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	21,422	2,027	—
IMPORTS	4	9,690	—	—
PRODUCTION ...	159	—	3,323	—
CONSUMPTION ...	163	14,876	2,667	10,839
Exports	—	141	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	18,603	2,683	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS AT END OF PERIOD	14,180
IMPORTS	—
PRODUCTION	2,373
CONSUMPTION	1,779
EXPORTS AND RE-EXPORTS	190

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	412
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	404

CADMIUM

TOTAL CONSUMPTION OF CADMIUM	4,290

Surface Finishing of Aluminium—I

Cladding, Spraying and Anodic Treatment

by D. H. NAPIER, M.Sc., A.R.I.C., and J. V. WESTWOOD, M.Sc., F.R.I.C.

THE increasing use of aluminium and its alloys is arrestingly illustrated by a comparison of metal production figures to-day with those of 60 years ago. In the interval the total weight of metal produced has increased more than 2000-fold. It is displacing many other metals, such as steel and copper, brass and bronze from exalted positions. In the process it is, of course, bringing particular problems of its own.

Corrosion Resistance

Apart from the valuable properties of lightness and strength which so commend the metal, it possesses appreciable corrosion resistance, due to the pressure of a very thin film of oxide (approximately 40 A thick in the case of pure aluminium).[1]

Unfortunately, this film is easily fractured and although it is to some extent self-healing, it is necessary where resistance to corrosion for long periods is required to give added protection—by chemical, electrochemical and other types of treatment. In general, these are essentially processes for building up a compact film of aluminium oxide on the surface which can attain a thickness of several thousandth of an inch,[2] and can be extremely abrasion resistant.

Other methods of protecting aluminium and especially its alloys are by cladding and spraying with pure aluminium. The latter has a greater resistance to corrosion than the alloys and can be more effectively treated by chemical and electrochemical means. The more complicated plating of aluminium is also used to produce protective and decorative effects.

Pre-Treatment

There are, in addition to the protective measures, a variety of decorative processes. The oxide film is capable of absorbing and retaining dyes,[3] thus allowing a wide range of coloured finishes. To this the process of electro-brightening can be added, so that highly reflecting surfaces of a permanent nature, only slightly inferior to that of polished silver, can be produced. All these embellishments can be carried out simultaneously with the protective processes.

In this article some of these various protective and decorative processes are dealt with.

The metal, as received, requires pre-treatment according to the type of finish that is to be applied. Grease on the surface, often applied deliberately to avoid corrosion in transit, must be removed prior to chemical or electrochemical treatment.

Mechanical treatment of the surface may also be necessary. For subsequent metal spraying, sand or shot blasting is used. This cleans and roughens the surface, and results in good adherence of the sprayed metallic film. Buffing may also be required, particularly if a bright or polished surface is wanted. In general it is done with softer mops than those used for other metals since hard mopping may "burn" the surface, leaving permanent stains on the work. After such mechanical treatment the metal must be cleaned to remove dirt, polishing soap, etc.

Degreasing can be carried out in one of three ways:—

(1) Using trichlorethylene vapour. Compact self-contained plants for this purpose are available, heated by steam or electricity. It is, however, necessary to exclude moisture, as this causes hydrolysis and the formation of hydrochloric acid, which will rapidly attack the aluminium, in spite of the oxide film. This, however, can be minimised by the addition of aliphatic amines to the trichlorethylene, which neutralises the acid formed.

Alkaline Degreasing

(2) Immersion in hot dilute alkali. This usually contains caustic soda or sodium carbonate, with added sodium phosphate or silicate. Some attack of the metal occurs, but the addition of phosphate or silicate is claimed to inhibit such attack. The concentrations of solutions, temperature and duration of treatment are very variable and will often vary with different alloys.

Following the alkali dip, the metal is usually immersed in (1 : 1) nitric acid. This removes adsorbed alkali and also the "smut" which is produced in certain alloys, *e.g.*, duralumin, due to the presence of copper.

In general the length of immersion in both cases should be short to avoid heavy etching of the metal. A typical example of such pretreatment is quoted by Ollard and Smith.[4] This employs sodium carbonate 4 oz./gal. and sodium meta-silicate 4 oz./gal. with a melting agent (Lissapol Teepol, etc.) $\frac{1}{8}$ oz./gal., at 80-90°C. for 0.5-5 minutes.

Fluorides may also be used, but the metal

attack is much greater in alkaline solution.[5]

(3) Immersion in a hot oily degreaser. This is a composition of kerosene and soap. The grease is dissolved by the kerosene and the excess of it is removed by washing with water. An emulsion is formed in which the soap acts as a stabiliser.

Etching of the surface is often carried out for decorative purposes and various solutions are used according to the "depth" of etch required. In general these are alkaline baths not unlike the degreasing baths quoted above. Hot caustic soda gives a deep and somewhat uneven effect. Acid fluorides[6] give a very fine etch but should first be cleaned in a solvent degreaser.[7]

Both processes can be applied to aluminium alloys as well as other metals Cladding consists of hot rolling sheets of pure aluminium on to either side of a sheet of alloy. Duralumin is treated in this way with a cladding of pure aluminium of thickness 5 per cent of the total. This compound sheet is known commercially as Alclad. The resulting sandwich has greater resistance to corrosion and is better from the point of view of decorative finish, while the original strength of the alloy is maintained.

Cladding of Iron

It should be mentioned here that cladding of iron and steel is also carried out, though spraying is usually employed.[8] This is done using a British Wire or a Mogul (U.S.A.) pistol. The metallic film, unfortunately, is not very suitable for subsequent chemical or electrochemical treatment since it is usually thin and porous.[9] It does, however, act as a good protecting coating to the underlying metal.

If aluminium or its alloys is made the anode of a cell containing a suitable electrolyte, it becomes covered with a film of aluminium oxide. The oxide should be soluble to some extent in the electrolyte, otherwise the film will be non-porous, and current will flow only by sparking at high voltage. Due to this solubility, however, the film does not increase indefinitely and a limiting thickness is usually obtained.[10]

The film obtained is porous and capable of absorbing dyes, so that decorative effects are possible. In addition, it is usually hard and confers considerable abrasion resistance to the metal.

Electrolytes used for such treatment can be divided into the following types: (a) Chromic acid, (b) oxalic acid, (c) sulphuric acid.

(a) This is the process used by Bengough and Stuart and is named after them.[11] Treatment is as follows: Electrolysis is carried out in 3 per cent chromic acid solution at 40°C. and the voltage is controlled on the following time cycle 0-40 volts during the first 15 minutes, maintained at 40 volts for 35 minutes, 40-50 volts during the next 5 minutes, maintained at 50 volts for 5 minutes. Direct current is used and the current density used lies between 0.3 to 0.4 amps./dm^2.

This process has some disadvantages. The film is somewhat opaque, due to the retention of chromium compounds.

Treatment is essentially a batch process, which is a serious disadvantage where different alloys are involved. Further, the time of treatment is long compared with that in other electrolytes.

Preventing Corrosion

One advantage, however, which is probably the reason for continued use, is that the electrolyte which may be occluded, as in the case of rather porous castings, tends to prevent rather than assist corrosion. The opacity of the film, also, has been welcomed by some on the grounds that when dyed the colours are rather mellower than those obtained after anodic treatment in sulphuric acid.

Alloys with a silicon content greater than 5 per cent cannot be treated successfully by this method, while those containing copper give rise to a high initial current and a consequent increase in the temperature of the electrolyte.[12] Such an increase in temperature increases the solvent effect of the electrolyte and if the increase is sufficient a discontinuous, non-adherent or "burnt" film is produced.

(b) Solutions of oxalic acid, of 0.5—10 per cent concentration using d.c., a.c. and a.c. super-imposed on d.c. have all been used.[13] Since the rate of attack of the film by oxalic acid is low, relatively thick films (over 0.002 in.)[14] can be obtained at low temperatures. When d.c. is used, the film is clear and practically colourless, but with a.c. the film has a golden colour, which has some decorative value.[13] The only advantage of using a.c. is that the onset of "pitting" and localised attack on the electrodes is avoided. On the other hand, using a.c. the energy consumption is much greater.

Solvent Action

D.c. treatment can be conveniently carried out at 2 amps./dm^2 using a bath of 3-6 per cent oxalic acid maintained at 18°C. and applying a starting voltage of 20 and increasing to 50 and 60.[15] Such a bath has small solvent action on the anodic film and is suitable for subsequent dyeing.

A.c. treatment can be applied using a bath containing 3-10 per cent oxalic acid which is operated at 18°C. using a commencing

(*Continued at foot of following page*)

Stripping Surface Films

Basis of CRL Metal Studies

THE invisible protective film on polished stainless steel, which has a thickness of about 1/200th of a cigarette paper, has been removed for examination—records a Press report issued by the DSIR. It is part of work on film stripping now being developed at the department's chemical research laboratory.

The work is of particular value to the production of improved industrial finishes. Knowledge of the physical and chemical state of the surface layers of a metal is important because the application of finishes depends intimately on the condition of the metal surface immediately before the final treatment.

The original technique of film stripping by chemical methods was applied to iron and made use of an aqueous solution of iodine. This solution attacks the iron just below the surface of the overlying oxide film, permitting the film to be loosened and stripped.

Iodine and Alcohol

The work done by the CRL uses a solution of iodine in anhydrous methyl alcohol, the stripping being carried out in an atmosphere of nitrogen. Water and oxygen are therefore excluded and the film cannot be contaminated during the stripping process.

By reinforcing the film with a coating of synthetic resin it can be removed in one piece and mounted on glass for examination. The composition of the films may be conveniently studied by electron-diffraction, both of the oxide films *in situ* and of the stripped films.

This method has already been used to study the thickness and composition of oxide films formed on iron and steel at ordinary and at higher temperatures, and of the film on polished stainless steel.

Work is in progress on the possible application of the method to other metals, and nickel has given good results. It is expected that modifications of it will achieve equally good results with others.

Possible applications with ferrous metals are the study of the oxide films produced by different methods of physical and chemical preparation. The study of the metal films has a direct bearing on finishing, for coatings made by chemical pre-treatment of steel are often used to increase the adhesion of the final paint or enamel.

An exhibit showing apparatus for film-stripping developed at the Chemical Research Laboratory and electron-diffraction diagrams made by the Metallurgy Division, National Physical Laboratory, will be on view at the Physical Society Exhibition.

Control of Metals

Extent of Govt. Buying and Distribution

IN reply to a question in the House of Commons from Mr. William Shepherd, the Minister of Supply (Mr. G. R. Strauss) said :—

Raw materials controls are limited to non-ferrous and light materials, and iron and steel. My Department is the sole purchaser of virgin copper, lead and zinc, and controls the acquisition of these metals in the form of ores, concentrates and scrap, as well as in their virgin form. Only the allocation of lead is strictly controlled. All tin metal produced in the United Kingdom is purchased by my Department and sold to the manufacturers. Similarly, all virgin aluminium and virgin aluminium alloy produced in or imported into the United Kingdom, apart from a small quantity for export, is purchased and sold to the fabricators. The acquisition, disposal treatment, use and consumption of iron and steel, and the principal ores from which they are produced are controlled, and also the acquisition and disposal of iron and steel scrap.

SURFACE FINISHING OF ALUMINIUM—I

(*Continued from preceding page*)

voltage of 20 and increasing to 50-60. Temperatures of 40-50° may also be used but the maximum voltage is then 30-40.[15]

Films produced by d.c. treatment are very hard and confer considerable abrasion resistance to the underlying metal. Claims have been made that these are the hardest type of anodic film, but it is unlikely that they are any harder than those produced by the sulphuric acid treatment, appropriately carried out. They are, however, inelastic and if the metal is deformed the film cracks in a series of very fine fissures, perpendicular to the axis along which bending occurs. This is termed "crazing."

(*To be continued*)

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[15] See [13].

IMPROVING STEEL TECHNIQUE

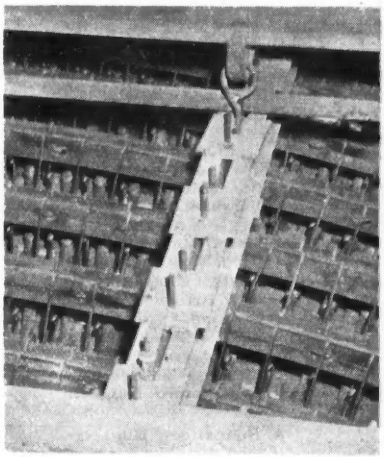
Higher Temperatures with Chrome Magnesite Bricks

A NORMAL old-type open-hearth steel furnace, at the Redbourn Works, near Scunthorpe, Lincolnshire, of Richard Thomas & Baldwins, Ltd., was recently demolished and a new all-basic one built in its place in 27 successive working days. To enable the conversion to be effected without loss of production, the firm scheduled to do the work of completely dismantling the old furnace and erecting the new one in a total time of six weeks, a feat considered by many at the time to be impossible.

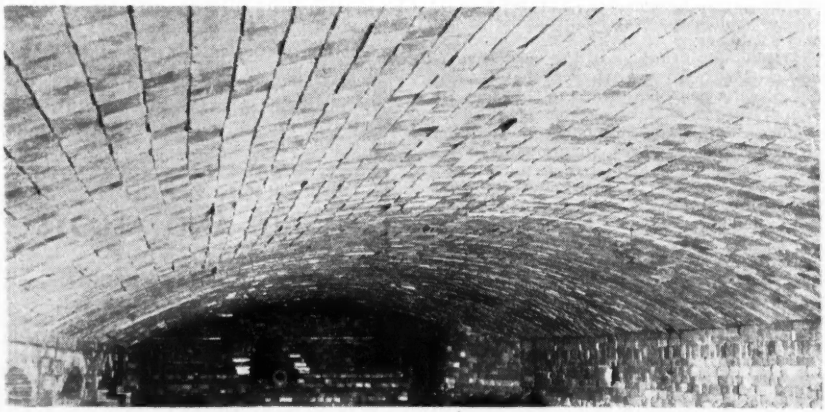
The 27 days' performance is believed by the company to constitute a world record. The new experimental furnace is one of five commissioned by firms co-operating with the British Iron & Steel Research Association.

Before the war, Richard Thomas & Baldwins, Ltd., were, they claim, pioneers in this country in the building and use of "all-basic" furnaces, *i.e.*, furnaces built with chrome magnesite bricks in place of the customary silica bricks. Up to the war all but one of the all-basic furnaces built in this country used imported Austrian bricks. Richard Thomas & Baldwins had the only complete furnace built with English-made bricks, but these were made from imported chrome ore and imported magnesite.

During the war years, all steel manufacturing firms in this country were forced back to silica roofs in their furnaces owing to the shortage of imported magnesite. After the war it was felt that the all-basic furnace work should be taken up again, and in co-operation with the British Iron and Steel Research Association arrangements



Above the furnace roof, showing rods suspending the bricks



Suspended roof of main arch of the new type open-hearth steel furnace

were made for five of such furnaces to be put up, one of these to be at Redbourn.

The advantages of furnaces built with all-basic bricks have been found to be three-fold :—(a) The furnace will stand a higher temperature and, therefore, permit of being worked at a faster rate—with increased output. Silica roofs stand 1650-1700°C.; chrome magnesite roofs will stand 1750°C. (b) The life of the furnace is considerably increased and fewer repairs are necessary during this life. This is a vital matter now that a continuous working week is in practise in most steel furnaces in this country. (c) The quality of the resultant steel is improved, due to higher working temperature and absence of any silica.

The extent to which this magnesite made from magnesia extracted from sea water is used in this country, for the making of steel furnace bricks, is now considerable, a representative of THE CHEMICAL AGE was informed by the British Iron and Steel Research Association, and this has been made possible by the manufacturers of the magnesite having succeeded in reducing the lime content to about 2-3 per cent, which is comparable with mined magnesite.

A Suspended Roof

In order to minimise the stress, and thus permit the use of the English-made sea-water magnesite bricks—which are weaker than the silica bricks of which the furnace roof is normally constructed, but which will stand higher temperatures—the suspended roof principle was adopted in the furnace at Redbourn, the method of suspension being that of the M.H. Detrick Co., Ltd. The adoption of this principle has permitted the design to incorporate the latest results of aerodynamic researches relative to air and gas flows.

Another disadvantage of the chrome magnesite bricks is that they "spall"—*i.e.*, flake off—when subjected to changes in temperature, but the operation of the continuous working week minimises the liability of temperature changes, thus making it far more economically attractive to install the "all-basic" roof, in the knowledge that high temperature will be maintained.

An undoubted advance has been achieved in that it is now possible to make chrome magnesite bricks in this country, comparing favourably with the very finest basic refractories imported from Austria before the war.

The hearth of the furnace at Redbourn is also of a new type for this country, being of graphitised dolomite made and supplied by the Monolithic Dolomite, Ltd. Only 24 hours are needed to put in this against the four days with the usual type of tarred dolomite hearth.

Ceylon's Iron Resources

Full Development Intended

From our Special Correspondent

ACCORDING to Mr. G. G. Ponnambalam, Ceylon's Minister of Industries and Industrial Research, the Government of Ceylon will tap the 6 million tons of iron ore in the south-west of the Island, as the first step in setting up an iron and steel industry. The minister added that the first stage in the Government's blue-print would be a small-scale iron furnace for smelting scrap and iron ore. This, he said, would be ready some time in February.

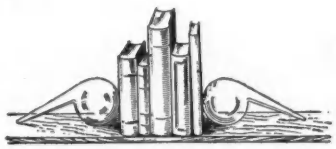
Mr. Ponnambalam, who recently returned from a tour of Europe, said : "I have been particularly interested in studying the development of the iron and steel industries in Sweden, Switzerland and Germany. Considering their limited size, Sweden and Switzerland have a number of object lessons for a small country like Ceylon in the development of the iron industry, which is absolutely essential as a basic industry in any programme of industrialisation."

The capital equipment and technical assistance, he added, of countries like Sweden or Switzerland or Germany, would be of invaluable help to Ceylon. Mr. Ponnambalan said he would strongly urge Ceylon's youth to turn to industrial and chemical engineering.

The minister has lately inspected the Braithravate iron and steel mills in South India, and his conclusion is that an oxygen furnace is best suited to local conditions. He is confident that Ceylon's resources of iron ore and reserves of steel and iron scrap are of such dimensions that an iron and steel industry could be maintained for 50 years, on a conservative estimate.

Thorium in Ceylon.—Investigations to discover deposits of thorium sufficient to work on a commercial basis are being carried out by the Ceylon Government. Deposits located so far are suitable only for working on a laboratory scale.

A CHEMIST'S BOOKSHELF



Outlines of Physical Chemistry. Farrington Daniels. 1948. New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd. Pp. viii + 713, Figs. 164. $5.

Several generations of American physical chemists have been trained on Getman's "Outlines of Theoretical Chemistry," which, in 1931, became "Outlines of Physical Chemistry" by Getman and Daniels. Since 1931, the book has received from the junior author four extensive revisions which, with the changing face of physical chemistry, have revised the original text out of existence, producing what is in effect a work entirely by Professor Daniels. This, the fourth revision, is therefore rightly issued as the first edition of a new book.

The book makes an excellent impression. The subject matter dealt with is orthodox, as will be seen from a glance at the chapter Theory: Photochemistry: Atomic and Molecular Forces: The Crystalline State: Physical Properties and Molecular Structure: Heat, Work and Heat Capacity: Thermochemistry: Thermodynamics: The Liquid State: Solutions: Solution of Non-volatile Solutes: Chemical Equilibria: Phase Diagrams: Chemical Kinetics: Electrical Conductance: Electromotive Force: Ionic Equilibria: Colloids: Quantum Theory: Photochemistry: Atomic and Nuclear Structure. What is, perhaps, rather more unusual, is the treatment, in which Prof. Daniels has steered a very successful middle course between an elementary textbook, and a work too comprehensive for all but the most advanced workers.

Prof. Daniels has given instead a very adequate and lucid outline of the fundamental topics in physical chemistry. The text is not overloaded with too much detail or with unnecessary side issues and the normal pass degree student will find practically all that he requires in this book. He will not find it easy going, but can acquire here a grasp of the whole field of physical chemistry. The honours student will find it an excellent base on which to build his more detailed knowledge gained from specialised reading. The most attractive feature, to the reviewer, is that this is no ordinary textbook to be tossed into the limbo of forgotten things once the degree has been acquired: it is a book to which the practising chemist will turn, again and again, to refresh his knowledge of fundamentals. In this it is fulfilling one of the most important requirements of the really first-rate university textbook. The reviewer, with a moderate acquaintance with a wide range of textbooks of physical chemistry of about the same level, can think of none which has more favourably impressed him.

The illustrations have been admirably chosen, and many of them are novel. Many mathematical problems are included, since Prof. Daniels believes "solving problems is the best way to learn physical chemistry" (so the professor writes). An appendix contains mathematical derivations of a number of equations which can be studied by the more advanced student, and advanced material, such as the Debye-Hückel theory and an introduction to statistical thermodynamics. The title is perhaps a trifle misleading, suggesting a textbook of a standard approximating, in this country, to Intermediate or a little higher. This, emphatically, is not the case.

Fundamentals of Physical Science. Konrad Bates Krauskopf. Second edition. New York: McGraw-Hill Book Company, Inc. 1948. 27s.

Teachers of physical science have always held this scholarly, well balanced survey text in high esteem, and will therefore welcome the new edition. Noteworthy new features are a discussion of the principles underlying the atom bomb and other applications of atomic energy and details of organic chemistry, introducing more recent developments in such fields as synthetic rubber and the new plastics, as well as other rapidly advancing techniques. Although the book is primarily addressed to students, it is capable of affording wide interest to a very much larger public. Material is taken from the four sciences of astronomy, physics, chemistry, and geology, and the matter presented in six parts: the solar system, matter and energy, the structure of matter, fundamental processes, the biography of the earth, and stars and galaxies. The relatively wide bibliography quoted, the 330 figures and the coloured plate of spectra compensate in large measure for the inability to present in any great detail the entire sciences involved.

Personal

OFFICERS of the Food Group of the Society of Chemical Industry for the session 1949/50 have been appointed, with effect from the annual general meeting of the society on April 13, as follows: DR. E. B. HUGHES, chairman, becomes vice-chairman; MR. A. L. BACHARACH becomes chairman; and DR. J. R. NICHOLLS and MR. L. H. G. BARTON have been re-elected honorary treasurer and honorary secretary, respectively.

Among overseas members elected to Fellowship of the Textile Institute this month are DR. A. B. SEN GUPTA, research chemist of the Indian Jute Mills Association Research Institute, Calcutta, and DR. J. H. DILLON, director of research at the Textile Foundation and the Textile Research Institute, Princeton, U.S.A.

Works manager of the I.C.I. plant at Middleton, Nr. Morecambe, Lancs., for the past eight and a half years, DR. L. E. SMITH is being transferred to the company's Plastic Division at Welwyn Garden City. Dr. Smith has been with I.C.I. for over 20 years and has been active in the Morecambe area in furthering educational work. Trained in heavy chemical production, Dr. Smith is now engaging for the first time in the plastics side of the organisation.

The following were elected as officers of the Association of Tar Distillers at a recent annual general meeting: President: MR. C. LORD; vice-president and hon treasurer: CAPT. C. W. HARRISS; hon. auditor: MR. E. HARDMAN. The executive consists of the following: MESSRS. W. MCFARLANE, T. A. WILSON, A. E. BROWN, C. LORD, J. COLLIGON, W. A. WALMSLEY, S. BILLBROUGH, A. BRADBURY, G. F. PEIRSON, W. H. PHILLIPS S. ROBINSON, S. ROBERTS, A. G. SAUNDERS, H. H. BATES, T. H. BUTLER, C. W. HARRISS, C. F. SULLIVAN, E. HARDMAN, C. F. DUTTON, C. E. CAREY and COMMDR. C. BUIST.

DR. W. H. HOOK has been appointed deputy chief research chemist to British Schering Research Laboratories, Ltd. His researches, under the direction of Sir Robert Robinson, have included investigations into the synthesis and physical behaviour of compounds of interest in the chemotherapy of tuberculosis.

MR. ARTHUR DORAN, chief chemist to Edinburgh Corporation Gas Department, has retired, for health reasons, after 40 years' service.

MR. B. H. TURPIN, a director of Quickfit & Quartz, Ltd., chemical glassware manufacturers and a subsidiary of the Triplex Safety Glass Co., Ltd., is visiting the U.S.A. to investigate markets for scientific plant and chemical glass.

MR. F. C. KNOWLES has been appointed a director of Evershed & Vignoles, Ltd., electrical and mechanical engineers, on his retirement from the position of sales manager, to which MR. W. A. SHAW has been appointed.

MR. A. TROBRIDGE (president), MR. W. S. COATS (chairman), and MR. W. A. BRIGGS (hon. secretary) are among the principal officers of the Newcastle Chemical Industry Club, which at its recent annual meeting reported a reduction in membership last year from 130 to 120.

The Board of Trade has announced the following new appointments as regional controllers of the Board of Trade: Northern Region: MR. K. G. SILLAR has been appointed as successor to the late Mr. J. G. Rhodes and will take up duty at Newcastle on April 11. London Region: SIR QUINTIN HILL, regional controller for the South-Western Region, is to be transferred to London in succession to Captain S. J. Graham, who is retiring at the end of April. South Western Region: MR. GRAHAM GLENNIE will succeed Sir Quintin Hill at Bristol. Eastern Region: CAPTAIN H. K. ORAM, R.N. retired, deputy director of furniture production at Board of Trade, who took up duty at Cambridge at the end of March.

The Steel Bill

The last person who would benefit from the nationalisation of the British steel industry would be the steel worker, said Mr. Alfred Edwards, Independent M.P. for East Middlesbrough, speaking at Glasgow last week. Mr. Edwards, who was expelled from the Labour Party last year because of his attitude to nationalisation policy, said that "a reluctant Government" was being forced to bring in the nationalisation Bill by extremists of the extreme Left and some who were not in the party at all. The industry had achieved wonders and the proposal to take it out of the hands of those who could manage it efficiently was a stupid blunder.

Technical Publications

RECOGNITION of the frequency of the occurrence of hydrogen in chemical processes and compounds has impelled the compilation by the U.S. National Bureau of Standards of thermal properties of hydrogen in its various isotopic and ortho-para modifications.* The publication presents the available thermal data for H_2, HD and D_2 in solid, liquid, and gaseous states and the distinctive properties of ortho- and para-forms of H_2 and D_2. Some of these data are new and original. The thermal data include thermodynamic functions for the ideal gas state, equilibrium constants, data of state, viscosity, and thermal conductivity with dependence on the pressure, vapour pressure, solid-liquid equilibria, specific heats, and latent heats. Values of state derivatives useful in thermodynamic calculations have been given for normal hydrogen, and the related differences between thermodynamic functions for real and ideal gas states have been evaluated. There is an extensive bibliography of references.

* * *

An informative review of the relatively numerous methods of colorimetry and the instruments which have been evolved is provided in "A Plain Talk on Colour Measurement," by A. J. Fawcett (1s.). The various methods are critically reviewed and the author, with the benefit of a family association with the science lasting over 70 years, is well qualified to provide expert guidance on the relative merits of such means as the visual and photoelectric spectrometers, the Loorbond colour seal, dye colour reference solutions and other comparators.

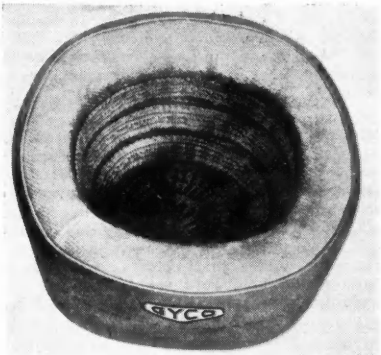
* * *

Means of avoiding the discoloration of the glass in cathode-ray tubes are some of the interesting points discussed in an article by J. de Gier on the "Projection-Television Receiver, II—The Cathode-Ray Tube." (*Philips Technical Review*, Volume 10, No. 4.) Other articles in this issue are "The Function of the Coating of Welding Rods," by J. D. Fast; "A Transportable X-Ray Apparatus for Mass Chest Survey," by H. J. Di Giovanni, W. Kes and K. Lowitzsch.

* * *

"The History of Bakelite, Ltd.," by T. J. Fielding, which the company has just published, records the evolution and growth of the company from the successful development of the first thermosetting resin in 1907, and casts some new light on earlier phases in the development of plastics in general and the designing plants for large-scale commercial production.

* Research Paper R.P. 1932, "Compilation of Thermal Properties of Hydrogen in its Various Isotopic and Ortho-Para Modifications," by Harold W. Wooley, Russell B. Scott and F. G. Brickwedde; 54 cents post paid from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.



(*Scientific Glass Apparatus Co., Bloomfield, New Jersey*)

In this American version of the electrical heater for flasks in the laboratory, the temperature control, set for most purposes at around 370°C, is secured by a thermostat in the jacket which is securely protected from interference by moisture or vapours

* * *

Two more safety data sheets in their series of chemical safety manuals have recently been published by the (U.S.) Manufacturing Chemists' Association. These cover ethyl ether (SD-29) and sodium cyanide (SD-30). Physical and chemical properties of the products are set out, health hazards and their control outlined, and methods of handling and the recommended types of containers for shipping are described. The sheets on sodium cyanide contain a section dealing with medical treatment prescribed for patients suffering from that form of poisoning, covered authoritatively by the Medical Advisory Committee of the association.

* * *

A review of research carried out in Denmark during the years 1939-45 has recently been published under the title: "The Humanities and the Sciences in Denmark during the Second World War" (Einar Munksgaard, Copenhagen). In its 723

Continued overleaf)

pages is given a full account of what has been achieved in these years in the fields of pure and applied sciences. The title of each paper is accompanied—when in Danish—by an English translation, and for each more important paper, irrespective of language, there is an English summary.

* * *

Non-ionic surface active agents in general and glycol and polyglycol esters of fatty acids are described in a reprint issued (free) by the Glyco Products Co., Inc., 26 Court Street, Brooklyn 2, N.Y. These products are interesting emulsifying, dispersing, stabilising and plasticising agents. Some of them are edible. Their unusual solubilities in water and certain non-aqueous media make them very versatile; some are insoluble in water. The higher melting members of this series are wax-like and dispersible in water.

* * *

The peculiar magnetic properties of the nickel-iron alloys, with their wide variations, have assumed increasing importance with the development of the science of electronics and a wide range of applications has now been established—notes the Mond Nickel Company, Ltd., which has now produced a specialised review of the subject, which should prove useful to designers and users of communication and electronic apparatus. It reviews the various groups of alloys, indicates their special properties and describes the applications for which they are appropriate. An extensive bibliography and a selection of curves add materially to the publication's usefulness.

NEXT WEEK'S EVENTS

MONDAY, APRIL 4

Society of Chemical Industry. London: School of Hygiene and Tropical Medicine, Keppel Street, W.C.1. 6.30 p.m. Joint meeting with R.I.C. Dr. A. Forster: "Recent Developments in Explosives."

West Ham Municipal College. London: College assembly hall, 7.0 p.m. Jubilee meeting. George Tomlinson, M.P.: "Further Education."

TUESDAY, APRIL 5

Textile Institute. Bolton: Municipal Technical College, Manchester Road, 7.30 p.m. F. Charnley: "The Drafting of Fibrous Material."

British Association for Commercial and Industrial Education. Birmingham: One-day visit to the University. Sir Charles Tennyson: "Graduates in Industry."

WEDNESDAY, APRIL 6

Institute of Welding. Manchester: Reynolds Hall, College of Technology, 7.0 p.m. Annual general meeting and film show.

Institution of Works Managers. Leeds: Great Northern Station Hotel, 7.0 p.m. H. G. Winbolt: "Industrial Safety."

Society of Public Analysts and Other Analytical Chemists. London: Gas Industry House, Grosvenor Place, S.W.1. 7.0 p.m. C. R. Bond: "Report of the analysts' sub-committee of the Ministry of Health conference on the differential assay of penicillin. Part I"; other papers by P. B. Baker, F. Dobson and A. J. P. Martin, and J. W. Albans.

THURSDAY, APRIL 7

Royal Institute of Chemistry (London and South-Eastern Counties Section). Luton: Public Library Lecture Hall, 7.30 p.m. Joint meeting with Luton Scientific Association. E. Lester Smith: "Recent Developments in Biochemical Research."

Liverpool: University, 7.0 p.m. Dr. H. J. T. Ellingham: "Service to Chemistry and Chemists." Annual general meeting.

Institute of Metals. Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Annual general meeting.

FRIDAY, APRIL 8

Society of Chemical Industry (Plastics Group). Birmingham: The University, 6.30 p.m. Joint meeting with the Birmingham and Midland Section, and the Plastics Institute. Dr. K. W. Pepper and Dr. J. R. Riddell: "Fabric Based Plastics, Part II—Interlaminar Strength."

Oil and Colour Chemists' Association. Manchester: Engineers' Club, 6.0 p.m. Annual general meeting.

Institute of Production Engineers. Ipswich: H. W. Hobbs: "Practical Approach of Research in Industry."

The Royal Institution. London: 21 Albemarle Street, W.1, 9.0 p.m. Prof. P. M. S. Blackett: "Magnetic Field of Large Rotating Bodies."

Electrodepositors' Technical Society. Buxton: Palace Hotel. Annual conference (2 days). Technical session: Discussions on Metal Finishing.

SATURDAY, APRIL 9

Institution of Chemical Engineers (North Western Branch). Manchester: College of Technology, 3.0 p.m. C. B. Cox: "Countercurrent Fat-splitting by the Twitchell Process."

Home News Items

Uranium in U.K.—Deposits of uranium ore are reported to have been found in a mine at Cobham, Kent. The Ministry of Supply have asked for samples to be tested.

Aluminium Production—Ministry of Supply statistics relating to light metals in January include the following particulars (in long tons) of aluminium: Virgin: production 2501; imports 14,242. Secondary: production 5493.

Rising Cement Output.—Three cement works in Wales produced between them 36,316 tons during January. The new cement factory being constructed at Padeswood, Flintshire, is expected to be in production in July and will provide work for between 150 and 200.

A Cancer Virus?—Experiments described at a lecture of the Imperial Cancer Research Fund in London recently are reported in the current issue of the *British Medical Journal*. The experiments, concerned with the transmission of cancer in mice by dried tumour tissue, strongly indicated that a virus is involved.

Leicestershire Chemical Industries.—Among the firms who have booked display space at the Leicester and Leicestershire Industries Exhibition and Trade Fair, to be held at the Granby Halls, Leicester, from May 19 to 28 inclusive, are The Amoa Chemical Co., Ltd., The B. B. Chemical Co., Ltd., and Freeman Taylor Machines, Ltd. (makers of stainless steel vessels and equipment for chemical industries).

Safety Competition.—The Rockvilla and Cheapside Street mills, Glasgow, are the first winners of a competition started by the British Oil and Cake Mills, Ltd., as part of an intensified campaign to prevent accidents. At a dinner in Glasgow last week, representatives of the winning mills received a trophy from Mr. G. Chipperfield, chairman of the company, who stressed that safety could only be ensured by the co-operation of every worker.

Molasses and Urea.—The Board of Trade announces that urea is released from control as from April 1, and the maximum price for food-for-stock molasses is increased as from that date. This Order, The Molasses and Industrial Alcohol (Amendment) (No. 3) Order, 1949, gives formal effect to the decontrolling of one of the commodities mentioned in the President's announcement last week. The increased maximum price for molasses reflects the removal of the subsidy from feeding stuffs.

£250 for S.C.I. Meeting.—The Dunlop Rubber Company has contributed £250 towards the expenses of this year's annual general meeting of the Society of Chemical Industry in Manchester.

Prices of Oils and Fats.—The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending May 21.

Acetic Acid for Bakers.—The Ministry of Food is again making available to bakers this summer supplies of acetic acid to control "rope" in bread—80 per cent concentrations to large users and diluted (12 per cent) supplies to bakers using 100 sacks of flour or less weekly.

The Librarian in Industry.—Dr. D. G. Brown, librarian of the Nobel Division, I.C.I., Ltd., is one of the principal speakers ("The Problems of the Librarian in Industry") at the conference of the northern branch of Aslib to be held on May 6 at 22 George Street, Edinburgh, at which Mr. Douglas A. Foulis, president of the Edinburgh Chamber of Commerce, will preside.

Welding Conference.—The influence of welding on ship construction was the subject of an address by Mr. L. Redshaw on the opening day of the conference organised by the Institute of Welding and British Welding Research Association at Ashorne Hill, near Leamington. Sir Charles Lillicrap, Director of Naval Construction, Admiralty, presided.

New Fertiliser Research Group Projected.—At a meeting in London recently, leading members of the superphosphate and compound fertiliser manufacturing industries appointed a committee to form a fertiliser research association under the industrial research association schemes of the Department of Scientific and Industrial Research. This committee is discussing with the DSIR financial and other aspects of Government participation in the project.

Lower Prices for Penicillin.—Glaxo Laboratories Ltd., Greenford, Middlesex, announces that prices of several types and packings of penicillin are to be reduced from Monday next, April 4. This is the fourth time prices have been reduced since penicillin was made freely available in June 1946. Typical changes are: freeze dried sodium salt, from 80s. to 72s. 6d.; crystalline penicillin, from 160s. to 110s.; calcium penicillin, from 9s. to 7s. 6d.

American Chemical Notebook

From Our New York Correspondent

FOLLOWING preliminary investigations and preparations, the U.S. Bureau of Mines and the Alabama Power Company, formally began the final phase of the second R.S. coal gasification experiment last week, igniting with a thermite bomb a sealed-off bed of about 500,000 tons of coal on a site near Gorgas, Alabama. The gases resulting may be used for both heating purposes and for conversion into gasoline or diesel-engine oil. Part of the equipment is a very large compressor and gas turbine, originally intended for shipment to Russia. A similar experiment in gasification was successfully conducted by the Alabama Power Company on a smaller scale two years ago. The work now being undertaken is a much more extensive test to determine the economic value of the project.

* * *

Substantial increases in the mine production of gold and silver were achieved in the United States in 1947 as compared with the previous year, according to final annual figures just released by the Bureau of Mines. Gold reached 2,109,185 fine ounces and increase of 34 per cent and silver 35,823,563 ounces a gain of 56 per cent. California held its lead as the main gold producer.

* * *

The first continuous production for a terne-coating process utilising an electrolytic-pickling bath is now approaching full production at the sheet and tin mill, Gary, Indiana, of the Carnegie-Illinois Steel Corporation. (Terne coating applies a thin protective layer of lead and tin to sheet steel.) In the process the wide strip of metal travels through the new electrolytic pickling unit, a water scrubber operation, then through a zinc-ammonia-chloride flux. The next stage is the hot terne mix coating bath composed of 90 per cent lead and 10 per cent tin. The final treatment is in a hot palm oil bath.

* * *

A new plastics plant, for the full-scale manufacture of its plastic, Teflon tetrafluoroethylene resin, will be built by the E. I. du Pont De Nemours Company at its Washington Works, near Parkersburg, West Virginia. The company has for some time been producing Lucite acrylic resin, nylon and polythene plastics at the Washington Works, while Teflon manufacture has been confined to small-scale work at Arlington, New Jersey. Pilot plant production of the plastic began in 1943, but because of wartime restrictions, it was not possible to introduce it to the public until 1946. Among the outstanding properties claimed for Teflon, high resistance to temperatures from 550° to 570° F. and to acids, including those that will dissolve gold and platinum, and extreme electrical resistance. Indicating economies made possible by the use of Teflon in chemical industry it was said that when it was employed as packing in stainless steel valves, the plastic would last the life of the valves.

* * *

Speaking before the annual meeting of the American Brazilian Association in New York City, Dr. Harry B. Wright, anthropologist and explorer, said that great riches in mineral and other wealth await investors in the still undeveloped state of Mato Grosso in Brazil which he described as "one of the last undeveloped regions left in the world, representing a vast wealth of chemicals, lumber, wax, petroleum, metals and other materials." Dr. Wright, who was the only American to accompany the Roncador-Zingu Expedition which started out in 1943 and is still in the field, emphasised that the riches of Mato Grosso require foreign capital for development, for establishment of communications and industrialisation.

PHILIPPINES CHEMICAL PROSPECTS

THE establishment of a modern industry for the production of basic chemicals is one of the main objectives in the long-term policy of the Philippines Republic, according to the secretary of Commerce and Industry. Imports of chemicals into the islands rose from an annual value of $10 million before the war to $28 million in 1947. Construction of a caustic-soda plant is planned as part of the programme, and there is reported to be sufficient limestone available locally for the production of caustic soda from soda ash. Deposits of sulphur and pyrites are found in several areas and it is expected that local raw materials will be sufficient to maintain a plastics industry system

Overseas News Items

Belgian Coal Production.—Belgium's coal output amounted to 26.64 million tons last year, against 24.39 million in 1947.

Yeast From Pulp Wastes.—Twelve U.S. pulp makers, comprising the Sulphite Pulp Manufacturers' Research League, have placed in operation at Rhinelander, Wis., a commercial-sized experimental plant to transform spent sulphite liquor into dried yeast.

Netherlands Building Detergents Plant.—What is claimed to be one of the most advanced plants for manufacture of detergents is now being erected by the Bataafse Petroleum Maatschappij (of the Shell Group) in connection with its Rotterdam-Pernis petroleum refinery.

Australian Mica Prospects.—Expansion of mica deposits in the Harts Range, Northern Territories are reported to be under consideration by the Australian Government. The deposits of ruby mica, at present being worked on a small scale by individual groups of miners are claimed to be of better average quality than that of the comparable Indian grade.

ECA Quinine Deal with Holland.—In accordance with the provision regarding delivery of strategic materials to the U.S.A. by Marshall aid countries, Holland is to assign quinine sulphate through the Nederlandsche Kininefabriek, of Maarssen. During the next six months quinine valued at $278,000 will be required. This involves extraction from some 200 tons of cinchona bark.

Steel Plan for Europe.—A co-ordinated programme to employ £75 million for expanding and modernising Western Europe's steel industry has been accepted by the Economic Co-operation Administration. Britain and seven other countries are involved in the scheme, the aim of which is to increase crude steel output to a total for the eight countries of some 57.6 million tons in 1952-1953.

U.S. Manganese Deposits.—Plans for the development of large deposits of manganese in Maine are being studied by the Maine delegation in Congress. The deposits are the largest in the north-eastern States, and samples have yielded a manganese content of 25 per cent which could be raised to 37 per cent by milling. There is, however, a high silica content. Russian ores contain about 48 per cent manganese.

More Fertilisers for Egypt.—The Food & Agriculture Organisation has fixed Egypt's import quota of fertilisers at 710,000 tons for the current year, as compared with 405,000 for 1948.

Australian Phosphate.—Phosphate production on Nauru and Ocean Islands will regain the pre-war level next year, according to the U.K. member of the British Phosphates Commission, Mr. W. Bankes Amery. He says that this year 800,000 tons will be shipped from Nauru and over 1,000,000 tons next year.

Canadian Developments.—The Shawinigan Water and Power Co. are to spend over $53 million in capital construction in Quebec Province during the next three years, it was announced by Mr. James Wilson, president, at the annual meeting last week. This sum is part of a revision of the programme for 1947-52, and will bring the total expenditure for that period to $83 million.

Canadian Lithium.—Large deposits of spodumene, important source of lithium, have been discovered to the north-west of Winnipeg. Average Li-content of the ore is reported to be 5 per cent. The ore is at present being transported to Minneapolis (U.S.) for treatment. Plans in hand for the erection of a processing plant near Winnipeg foreshadow the creation of a new industry in Canada.

Belgian-Luxembourg Steel.—Belgian steel output last year amounted to 3.9 million tons, 70 per cent more than in 1947. In the last three months of 1948, output corresponded to a yearly rate of 4.3 million tons. Luxembourg steel output also made considerable headway last year amounting to 2.7 million tons. Thus, output of the Belgium-Luxembourg Customs Union was 6.6 million tons, compared with 3.7 million tons in 1938.

Nitrates by Solar Evaporation.—The new solar-evaporation process for the production of sodium and potassium nitrates in Chile has passed the experimental pilot-plant stage. Arrangements for exploitation of the process on a commercial scale are now in progress by two nitrate companies working in collaboration. It is expected that the method will be comparatively economical and will substantially extend the life of the available nitrate grounds and permit the use of residues.

Modernised Lime Quarrying

Yorkshire's New Type Kiln

A NEW type of kiln which will do all the tasks now carried out by workmen is part of the mechanisation scheme now being carried out by a Yorkshire limestone company.

Nearly £150,000 has already been spent on plant by Settle Limes, Ltd., and a further £100,000 has been allocated to complete the work.

The new kiln, invented by Dr. Norman Knibbs, is expected to be in operation by June and it is hoped to produce the purest type of lime which will be sent to the tanneries for treatment of delicate hides, and to the chemical industry.

There is only one other kiln of this kind. It was installed a few months ago near Croydon, Surrey, and burns only chalk. Settle Limes has decided to experiment with the burning of small stone, which at present is going to the blast furnaces, but which in normal times had to be dumped because of the lack of demand in the area upon such sizes. If this try-out is successful it is expected the company's production of lime would be increased by 15 per cent.

Great improvements in working conditions are being brought about by the mechanisation of the two quarries at Horton-in-Riddlesdale and Threshfield, and already output has improved. In 1947 before the scheme was begun, production was 178,000 tons; it is now at a rate of 350,000 tons.

SEISMIC OIL EXPLORATION

AN American scientist, Dr. T. C. Poulter, is claimed to have developed a new method for oil exploration by seismic means, sponsored by the Institute of Inventive Research, San Antonio. Dr. Poulter explains that his method, in one form, employs a pattern of small, specially shaped charges of explosive composition which are detonated above ground in contrast with the normal practice of firing a single, large charge in a shot hole at different depths below the surface.

Dr. Vagtborg, president of the Institute of Inventive Research, believes that the chief advantage of the Poulter method over those in current use are that it will eliminate the drilling of shot holes and their attendant costs, and permit speedier seismic mapping of given areas, states a recent article in the American *Midwest Engineer*. Seismic exploration may soon be possible in areas at present not suited to it.

Tests show the above-ground explosion method does not incur the risks of the shot hole method of damaging nearby structures.

Chemists' Centre

Unifying Belgian Pharmacists

LA Maison des Pharmaciens, a Belgian Centre for professional activity, has just been inaugurated at Brussels by the National Pharmaceutical Federation, representing professional unions and Belgian pharmacists. Among those associated with the new group were M. Tramasure, president of the Nationale Pharmaceutique, M. De Nye, vice-president of the Algemeen Apothekersverbond, the Minister of Public Health and representatives of many medical and chemical organisations. M. Tramasure, having recalled the assistance rendered by professional pharmaceutical unions in solving contemporary problems in the country, said the first objective of the Nationale Pharmaceutique was the creation of an Order of Pharmacists. Similar ideas were developed in Flemish by M. De Nys. The necessity for a professional pharmaceutical organisation to defend their interests and to improve service was acknowledged by other speakers.

Trading with Eastern Europe

Countries co-operating in the ECA programme will double their exports to Eastern Europe in the coming year, according to estimates submitted to the U.S. Congress. ECA estimates that Marshall Plan country exports to Eastern Europe will total $1490 million worth of goods in the 1949-50 period. Last year the export total was $788 million. Imports by Marshall Plan countries from Eastern Europe are estimated at $1680 million for the coming year. Last year the figure was $1163 million.

Authorisations have already been made for the purchase of Polish coal, Jugoslav non-ferrous metals and eastern German potash. "If present East-West trade developments continue," the ECA report says, "and particularly if recovery plans for bizonal Germany are successful, imports from the East by 1952 may exceed the pre-war volume of imports" (approximately $1300 million a year).

Indian Soda Ash and Salt

The rebate of import duty on soda ash into India has been renewed for a further period (ending December 31, 1949), owing to domestic production being still below the demand. Licences for the import of salt into India from all soft currency countries are to be granted liberally, within a total target limit of 160,000 tons, during the January-June, 1949 period, on condition that the c.i.f. of salt for Calcutta port does not exceed Rs.215 per hundred mds.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsibe for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HARMAN PLASTICS & ENGINEERING, LTD., London, W. (M., 2/4/49.) February 8, £1600 debentures; general charge. *£400. January 27, 1947.

Satisfactions

CELLULOSE COMPOSITIONS CO., LTD., Slough. (M.S., 2/4/49.) Satisfaction February 22, of debentures registered March 18, 1938, and balance of series cancelled.

DIXON PLASTICS, LTD., Earls Barton. (M.S., 2/4/49.) Satisfactions February 21, of mortgages registered January 25, 1946, April 26 and June 14, 1948.

GENERAL REFRACTORIES, LTD., Sheffield. (M.S., 2/4/49.) Satisfaction February 17, of mortgage and charge registered December 9, 1930.

HULL OIL MANUFACTURING CO., LTD., London, E.C. (M.S., 2/4/49.) Satisfaction February 18, £9750 outstanding July 1, 1908.

Receivership

COLOURFAST, LTD., manufacturers of varnishes, enamels, chemicals, etc., Rylstone, Holders Hill Crescent, N.W.4. (R., 2/4/49.) Mr. M. S. Josephs, C.A., of 36, Southampton Street, W.C.2, was appointed receiver and manager on February 18, 1949, under powers contained in debenture dated December 8, 1948.

Company News

Sales of the U.S. manufacturing chemists, **Charles Pfizer & Co., Inc,** in 1948 increased over $8.5 million to $47.7 million but because of declining prices net income rose only from $9.34 million to $9.58 million.

Rohm & Hass Co.—Net profits, after tax, amounted to $4,289,922 last year, as compared with $3,829,368 in 1947. Sales last year reached a new high level at $62,419,158 ($52,842,057).

The St. Joseph Lead Co., and its domestic subsidiaries in the U.S.A., report for 1948 a net income of $9,636,737 ($5,61 a share), against $12,537,761 ($6.35 a share) in 1947.

The following increases of capital are announced: **Manchester Oil Refinery, Ltd.**, from £550,000 to £650,000; **Durazone Co., Ltd.**, from £1000 to £20,000; **Technotex, Ltd.**, from £1000 to £6000; **Dales' Dubbin, Ltd.**, from £2000 to £4000.

New Companies Registered

L. J. Pointing & Son, Ltd. (465,970). Private company. Capital £50,000. Objects: To acquire the business of manufacturing chemists carried on at St. Mary's Chare, Hexham, as "L. J. Pointing & Son." Directors: L. J. Pointing and Mrs. M. Pointing. Solicitors: J. H. & G. Nicholson, Hexham.

Schuette & Son, Ltd. (12,824). Private company. Capital £6000. Objects: To acquire the business of a manufacturing chemist carried on by E. Schuette as Dwarf Products at 12 Fownes Street, Dublin. Directors: P. Schuette, S. Schuette, R. Schuette, S. Nolan.

Chemical and Allied Stocks and Shares

BUSINESS in stock markets has confirmed anticipations by remaining on a moderate scale, in anticipation of the Budget, although the City now appears rather more hopeful that the Chancellor may announce minor tax concessions. It is argued that Sir Stafford Cripps will have to provide incentives of some sort to industry in the interests of maintaining export trade. High taxation, more than any other factor, keeps up production costs, and there are slight hopes that the Budget may bring adjustments in the Profits and Bonus Taxes. The bonus tax bears unfairly on shareholders and incidentally is a serious obstacle to the raising of capital on reasonable terms. Many important industrial companies are in urgent need of more capital in order to replace or modernise plant and equipment for larger production and lower working costs.

Report of Doulton & Co., one of the few companies publishing full details of production costs, shows that total gross sales were £314,000 higher last year at £2,315,119. But against this, costs, including wages, advanced to £2,221,488, and profits were only £128,790 from this big turnover. The dividend is again 12½ per cent.

Chemical and kindred shares have been rather steadier in line with the prevailing tendency of markets. Imperial Chemical changed hands around 45s., reflecting confidence that the dividend total will again

be maintained at 10 per cent. Fisons fell back sharply to 55s. on further consideration of the annual report and accounts. The latter show earnings capacity to be at a high level, but, owing to the company's growing business and commitments, the market feels that before long more capital may be required. Elsewhere, Monsanto Chemicals have moved up further to 57s. 6d.

Albright & Wilson 5s. shares were firm at 29s. 9d., Amber Chemical 2s. shares 8s. Boake Roberts 5s. shares 30s. 6d. and Bowman Chemical 4s. ordinary 7s. In other directions, British Chemical & Biologicals 4s. preference eased further to 20s. 3d., W. J. Bush 5 per cent preference kept firm at 26s., L. B. Halliday 4½ per cent preference kept firm at 22s. 4½d. and Sanitas Trust 10s. ordinary were again 25s. 9d.

William Blythe 2s. shares have been dealt in at slightly over 19s. in anticipation of results showing a further improvement in profits, although dividend limitation will presumably prevent shareholders from benefiting. British Glues 4s. shares have been firm at 18s. and elsewhere, Borax Consolidated turned better at 52s. 6d.

British Xylonite firmed up to £5, De La Rue were 34s. 4½d., British Industrial Plastics 2s. shares 5s. 7½d. and the 4s. units of the Distillers Co. rallied to 27s. 4½d. Fears of the prospect of nationalisation caused a general marking-down of cement shares, although it is pointed out that if nationalisation were eventually proposed, market values of the shares would probably determine the compensation basis. Associated Cement fell to 74s. 4½d. before showing a small rally to 75s. 3d., it being assumed that the forthcoming results will probably not only maintain the dividend, but also repeat the special bonus payment made a year ago.

Boots Drug 5s. shares have been firmer at 52s. and United Molasses 42s. 6d., while British Plaster Board 5s. shares were around 22s. 7½d. Iron and Steels showed small movements in most cases, although in an associated sphere Babcock & Wilcox came back to 66s. Tube Investments were £6½ and Stewarts & Lloyds 56s. 10½d. oil shares lost ground on fears of a price-cutting "war" in the U.S.A. Shell fell sharply to 61s. 3d. and Anglo-Iranian changed hands slightly below £7⅞.

British Chemical Prices

Market Reports

STEADY conditions prevail in nearly all sections of the industrial chemicals market both as regards trade and prices. Delivery specifications continue to cover good volumes and there has been a fairly moderate inquiry for new business. With the general improvement in the supply position and the consequent relaxation of many of the controls, the pressure of buying orders has been lessened although the volume passing into consumption is, in the aggregate, probably not diminishing. Among the soda products there has been a fairly active call for sulphide, chlorate and bichromate of soda, while soda ash continues in good request. A steady demand at unchanged rates persists for the potash compounds. There has been little alteration reported in the coal-tar products market during the past week. Pitch and creosote oil continue to be active items both on home and export account and the pyridines are in good call at firm rates.

MANCHESTER.—In virtually all sections of the Manchester chemical market firm price conditions continue to be reported, although the actual position compared with recent weeks shows very little change on balance. Home-trade requirements in the general run of heavy chemicals, including the alkalis and the potash and ammonia compounds, are on a substantial scale and the past week has witnessed a steady flow of delivery specifications, especially from the cotton and woollen textile and allied industries. There has been a fair amount of fresh inquiry and also of actual new business, while a steady shipping movement has again been reported. Superphosphates and the compound fertilisers, as well as sulphate of ammonia, are now being called for in good quantities.

GLASGOW.—There has been little change in the Scottish chemical market during the past week, conditions still being on the quiet side. The demand for solvents continues to increase very slightly, but the demands for other industrial materials are fairly static. The supply position is about the same as a week ago, with deliveries for most materials being fairly prompt. There has been a tendency for prices to fall, although not to any noteworthy extent. In the export market conditions are still good, with turnover maintained.

Safety Glass Export Record.—Exports of safety glass in 1948 were a record, according to a statement by the Triplex Safety Glass Co., Ltd. Sir Graham Cunningham, chairman and managing director, said that the figures for Triplex laminated safety glass had risen steadily since the war, and were more than 30 times larger than the 1937-38 figures. The previous highest figure was for 1947, and the 1948 figure was over 4 per cent larger. This took no account of toughened safety glass, which is used almost entirely in finished motor cars.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Manufacture of interpolymers of aromatic vinyl hydrocarbon and oils.—L. Berger & Sons, Ltd., W. T. C. Hammond, and L. E. Wakeford. Aug. 22, 1946. 616,044.

Manufacture of polyamides.—I.C.I., Ltd., and E. Ellery. Aug. 22, 1946. 615,954.

Means for measuring the level of liquids in tanks.—A. H. Gregory. Aug. 23, 1946. 615,962.

Means for introducing and drawing-off measured quantities of liquids into and from tanks.—A. H. Gregory. Aug. 23, 1946. 615,963.

Active fillers for natural or synthetic rubber.—Compagnie Industrielle de Credit Soc. A.R.L. Feb. 12, 1946. 616,069.

Method of and apparatus for steaming fabrics.—Bleachers' Association, Ltd., H. D. Hart, and S. Melville. Aug. 24, 1946. 616,071.

Electric metal-spraying pistols.—W. E. Ballard. Aug. 27, 1946. 616,084.

Heavy-media separation process.—American Cyanamid Co. Sept. 26, 1945. 616,087.

Atomisers.—H. E. Curry. Aug. 27, 1946. 616,089.

Production of anti-bacterial substances.—Boots Pure Drug Co., Ltd., R. Falconer, M. Lumb, and G. Sykes. Aug. 27, 1946. 616,102.

Process for recovering alumina and a residue rich in iron out of bauxites and similar ores.—J. C. Seailles. April 28, 1943. 616,103.

Fungicides.—M. Fitzgibbon. Aug. 27, 1946. 616,105.

Production of joints for pipes made of thermoplastic resin materials.—I.C.I., Ltd., and G. C. Tyce. Aug. 28, 1946. 616,115.

Curved shanks or holders for welding electrodes or other tools adapted for the circulation of coolant fluid therethrough, and the manufacture thereof.—Mallory Metallurgical Products, Ltd., and N. A. Tucker. Aug. 28, 1946. 616,121.

Production of cellulose derivatives.—British Celanese, Ltd. Sept. 11, 1945. 616,132.

Production of regenerated cellulose textile materials.—British Celanese, Ltd. Oct. 5, 1945. 616,133.

Polymers and copolymers of 2-vinylfluorene.—British Thomson-Houston Co., Ltd. Aug. 28, 1945. 616,134.

Preparation of tocopherol concentrates.—Distillation Products, Inc. May 31, 1946. 616,142.

Mechanical handling means for liquid treatment apparatus.—K. G. Larsson. Aug. 29, 1946. 616,151.

Manufacture of fibres such as glass fibres.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauney & Cirey. Sept. 1, 1943. 616,153.

Building constructional elements comprising translucent or transparent units and the method of producing the same.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauney & Cirey, and P. Bertrand. June 1, 1945. 615,971.

Nitramines and their preparation.—Honorary Advisory Council for Scientific & Industrial Research. July 19, 1944. 615,793.

Manufacture of amide derivatives.—Soc. of Chemical Industry in Basle. April 27, 1943. 616,694.

Inoculants for cast iron.—Mond Nickel Co., Ltd. Sept. 1, 1943. 616,784.

Arterial embalming fluids.—J. L. Switzer, and R. C. Switzer. Jan. 31, 1945. 616,787.

Pyroligneous liquors for preserving food products and methods of preparing the same.—Usines de Melle. March 3, 1942. 616,790.

Electrical apparatus for indicating temperature with or without temperature regulation. Therma Electro Heating Manufacturing Co., Ltd. June 3, 1944. 616,791.

Catalyst regeneration.—Phillips Petroleum Co. June 24, 1944. 616,793.

Molten salt baths for the heat treatment of ferrous articles.—A. de F. Holden. Aug. 31, 1943. 616,796.

Production of cold deformed reinforcing steel member.—A. Frokjaer-Jensen. Feb. 26, 1942. 616,803.

Manufacture of azo-dyestuffs.—Ciba, Ltd. Dec. 19, 1944. 616,977.

Method for shock casting light alloys having a large solidification range.—R. Morane, and P. L. Margot. April 13, 1944. 616,810.

Manufacture of water gas or gas consisting largely of carbon monoxide and hydrogen.—Humphreys & Glasgow, Ltd., and A. H. Williams. Jan. 17, 1946. 616,811.

Production of corrosion resistant coatings on zinc and cadmium surfaces.—Rheem Manufacturing Co., and R. Mercer, Feb. 20, 1946. 616,813.

Process for the treatment of vanadium-bearing ores.—C. Spigerverk. July 1, 1939. 616,985.

Manufacture of dispersing agents.—H. Schou. July 6, 1943. 616,818

Continuous extraction of substances from solid matter by means of a solvent.—J. A. de Smet. April 16, 1946. 616,825.

Production of hydrogen containing gases. —J. C. Arnold. (Standard Oil Development Co.) April 18, 1946. 616,710.

Producion of alkyl phenols.—I.C.I., Ltd., and H. A. Basterfield. May 17, 1946. 616,829.

Lubricating compositions.—C. C. Wakefield & Co., Ltd., E. A. Evans, and J. S. Elliott. May 27, 1946. 616,881.

Manufacture of porous metal.—Sintered Products, Ltd., and J. W. Lennox. July 8, 1946. 616,839.

Synthetic rubber compositions.—J. C. Arnold. (Standard Oil Development Co.) July 9, 1946. 616,886.

Raising of natural oil and other liquids by gaseous pressure.—N. F. Brown. July 22, 1946. 616,887.

Production of styrene and other styrene compounds.—L. E. Jones. (Carbide and Carbon Chemicals Corporation.) Aug. 17, 1946. 616,844.

Air filtering apparatus.—A .N. Brand. Sept. 7, 1946. 616,891.

Production of hard pitch and oils from medium soft coal tar pitch.—Chemical Engineering & Wilton's Patent Furnace Co., Ltd., and T. O. Wilton. Sept. 10, 1946. 616,730.

Process for refining high-boiling dark-coloured mineral oils poor in aromatics.—N.V. de Bataafsche Petroleum Mattschappij. Oct. 5, 1945. 616,735.

Mechanical support for insulators.—A. B. Du Mont Laboratories, Inc. Sept. 26, 1945. 616,736.

Air heaters.—Kent Alloys, Ltd., J. W. P. Angell, and J. E. Yeomans. Sept. 10, 1946. 616,738.

Process for the manufacture of isophorone and related products.—Distillers Co., Ltd., H. C. Highet, and F. E. Salt. Sept. 10, 1946. 616,740.

Production of moulding powders from aldehyde resins and acid treated fibres.—H. W. Chatfield. Sept. 10, 1946. 616,742.

Nickel base alloy.—T. F. Bradbury. Sept. 11, 1946. 616,614.

Pumps for delivering liquids.—Megator Pumps & Compressors, Ltd., and F. W. McCombie. Sept. 11, 1946. 616,618.

Direct production of aromatic vinyl compounds and polymers thereof. Dominion Tar & Chemical Co., Ltd. Sept. 24, 1945. 616,751.

Means for indicating and/or recording forces.—Heenan & Froude, Ltd., and F. T. Wilesmith. Sept. 12, 1946. 616,626.

Manufacture of chlorinated derivatives of 2 : 5-dihydrofuran.—Distillers Co., Ltd., and T. Henshall. Sept. 12, 1946. 616,762.

Apparatus for dispersing ethereal oils and the like in air through vaporisation.—S. L. F. Eklund. Sept. 13, 1946. 616,772.

Insulating cover for a solidifying casting. —Ferro Engineering Co. Nov. 2, 1945. 616,847.

Preparation of polymerisable fluorine-containing esters, polymers and interpolymers thereof.—I.C.I., Ltd., and J. W. C. Crawford. Sept. 13, 1946. 616,849.

Manufacture of monoethers and butene-triol.—Distillers Co., Ltd., and T. Henshall. Sept. 13, 1946. 616,853.

Simple and compound microscopes.—J. K. Enock. Sept. 13, 1946. 616,854.

Method for increasing the resistance of stainless steel devices to sulphuric acid.—Soc. d'Electro-Chimie, d'Electro Metallurgie et des Acieres Electriques d'Ugine. Sept. 15, 1945. 616,856.

Electric welding apparatus.—B. H. Lepine-Williams. Sept. 16, 1946. 616,644.

Synthetic rubber.—Wingfoot Corporation. May 21, 1946. 616,645.

Treatment of sea water.—H. Gamlen, H. C. Gamlen, and J. E. Gamlen [trading as Gamlen Chemical Co.] Aug. 11, 1945. 616,863.

Lubricating compositions.—J. White (Widnes), Ltd., D. W. Forster, and M. Brooking. Sept. 17, 1946. 616,868.

Direct synthesis of alkyl substituted styrene polymers.—Dominion Tar & Chemical Co., Ltd. Sept. 24, 1945. 616,894.

Production of flashless propellent powders.—I.C.I., Ltd., S. Gordon, and E. Whitworth. Sept. 18, 1946. 616,898.

Air heating devices.—C. Dewandre Co., Ltd., and H. Blomeley. Sept. 18, 1946. 616,659.

Production of organic nitriles.—British Resin Products, Ltd., E. M. Evans, and H. Thurston-Hookway. Sept. 19, 1946. 616,904.

Overlay metals of aluminium base metal bonded to iron group metals or metal base alloys and a method of manufacture thereof. —Mallory Metallurgical Products, Ltd. Sept. 19, 1945. 616,775.

Bonding of non-ferrous metal alloys to iron group metals or metal base alloys.—Mallory Metallurgical Products, Ltd. Sept. 20, 1945. 616,663.

Process for the production of cyclohexenes.—E. I. Du Pont de Nemours & Co., and G. M. Whitman. Sept. 20, 1946. 616,671.

Production of organic sulphites.—British Celanese, Ltd. Sept. 27, 1945. 616,915.

Hydrolised interpolymers of vinyl fluoride with vinyl esters.—E. I. Du Pont de Nemours & Co. Sept. 21. 1945. 616,927.

Filtering apparatus.—K. L. Ellila. April 25, 1946. 616,935.

Preparation of tocopherols.—Distillation Products, Inc. May 8, 1941. 616,939.

Process for discharging dyeings and discharge pastes therefore.—J. R. Geigy, A.G. Sept. 26, 1945. 616,950.

Light diffusing surfaces.—I.C.I., Ltd., and E. Simms. Sept. 25, 1946. 616,952.

Treatment of streptomycin solutions.—Distillers Co., Ltd., P. D. Coppock, and J. F. Short. Sept. 25, 1946. 616,955.

Separation of coal by froth flotation.—Kitson & Co., Ltd., and E. A. Knapp. Sept. 25, 1946. 616,960.

Air distributor devices.—Sir F. C. Stewart. Sept. 26, 1946. 617,037.

Process and apparatus for uniting a plurality of fabric layers.—S. A. Leader. Sept. 26, 1946. 617,039.

Process for the preparation of polymerized ethylene in powder form. Sept. 27, 1946. Telegraph Construction & Maintenance Co., Ltd., H. F. Wilson, and B. Allwright. Sept. 27, 1946. 617,052.

Production of high-strength cast iron.—Chromium Mining & Smelting Corporation, Ltd. Oct. 5, 1945. 617,003.

Recuperators and air heaters for heat transfer apparatus.—D. Sismey, and F. A. Linforth. Oct. 1, 1946. 617,005.

Methods of separating materials of different specific gravity.—American Zinc, Lead & Smelting Co., and C. E. Wuensch. Oct. 1, 1946. 617,011.

Bearing materials and bearings made therefrom.—Mallory Metallurgical Products, Ltd. Nov. 23, 1945. 616,776.

Air-humidifying apparatus. Bahnson Co. Aug. 23, 1945. 617,027.

Growing Uses of Fibreglass

An ever-widening range of uses is being found for fibreglass products at home and abroad.

Insulation is an important need and for this purpose various forms of fibreglass are being used in buildings, ships, cookers and refrigerators, thermal insulation in aircraft, and battery separators, while, coated with PVC, fibreglass cloth has recently been used for fireproof proscenium curtains in cinema theatres.

On the railways fibreglass tape and fibreglass mattresses have been ordered as well as fibreglass rigid sections for water-softening plants.

Exports during December last year included despatches of fibreglass special filtration, sent to Australia and South Africa; fibreglass rigid sections to the British West Indies and Malta; fibreglass staple tissue to Persia, Iran and Syria, while inquiries have lately been received from India, Iraq, Nigeria and Turkey for various products.

Metallurgical Engineering

Institute of Metals Committee

THE council of the Institute of Metals has appointed a new standing committee—the Metallurgical Engineering Committee—under the chairmanship of Mr. D. F. Campbell, with the following terms of reference:

(a) To develop interest in metallurgical engineering in the non-ferrous metal industry and to promote the study of equipment and instruments used in the industrial melting, casting, and working of non-ferrous materials.

(b) To make recommendations to the council regarding the need for holding special meetings, discussions, and symposia; inviting papers or articles for publication; or the publication of books or other literature to attain the objects for which the committee was formed.

(c) To make suggestions to the appropriate committees of the institute in connection with the organisation of special meetings or the production of publications approved by the council on its recommendation.

Wood-Chemistry in Russia

An intensive development of wood tar chemicals is reported to be taking place in Russia. Wood tar oils are announced to be "an important ingredient for the improvement of power petrol performance," while starch and molasses, as a moulding sand binder in iron and steel factories, have been largely replaced by wood pitch, according to the chief of the central administration of Wood-Chemical Industries.

Laminated timber perfected from wood chemicals is claimed to have been used for underwater fittings of ships and machinery and is declared to be superior to white metal or bronze. Chemical components, formerly wasted, are also being extracted from wood-waste conversion.

Australia's Tinplate Needs

The demand for tinplate in Australia this year will exceed supplies by some 23,000 tons, according to the Australian News and Information Bureau, which states that 84,000 tons will be available from the United Kingdom and the U.S.A. and should prove sufficient to allow food manufacturers to operate on the same ration scale as last year. In spite of the shortage, additional tinplate has been made available by the Australian Government to the Food for Britain Fund which is expected to ensure the dispatch of an extra 5 million tons of food.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

AN expanding Middle East Oil Company urgently requires an Assistant Engineer to work initially in the London Office and be willing to accept transfer to the Persian Gulf after one year. Should possess B.Sc. Degee in Chemical or Mechanical Engineering. Will be required to assist in duties involving loading and bunkering facilities, oil gas distribution, and other oil control duties. Some experience of these duties essential. Experience in oil bunkers control with docks operating group of the Royal Engineers may be advantageous. Age 25–30. Salary starting £600-£700 per annum according to age and experience. Write, giving brief details, for application form, and quoting LO 133, to **Box "P.Y.," c/o J. W. Vickers & Co., Ltd., 7/8, Great Winchester Street, London, E.C.2.**

THE LIVERPOOL GAS COMPANY

APPLICATIONS are invited for positions on the Chemical Staff of the Liverpool Gas Company. Applicants should be qualified either by examination or experience in Science, Fuel Technology or the Carbonising industry.

The initial salary will be in accordance with the qualifications and experience of the successful applicants, rising in approved cases to an annual salary of £525.

The successful applicants will be required to pass the usual pre-employment Medical Examination and will be required to contribute to the Official's Superannuation Fund.

Application should be made on the official form, obtained by writing to the **Personnel Superintendent, 18/26, Bold Street, Liverpool, 1,** and should be returned to him on or before the 11th April, 1949. Copy, not original references should be enclosed.

SITUATIONS VACANT

APPLICATION is invited for the position of **Maintenance Workshops and Installation Engineer** for an important Chemical Works, Manchester area. Applicant should not be over 40 years of age, with Engineering Degree, A.M.I.Mech.E., or equivalent. Practical experience in Maintenance, Chemical Plant Erection and Design essential. Position offered is permanent and progressive. Only men of proved ability need apply. Address in first instance, with particulars of qualifications and experience in detail, and salary expected. Box No. 2784, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

CHEMIST or Physicist required to be responsible for the production of short lived radioactive preparations. Permanent and progressive position. Superannuation fund provided. Apply, giving particulars of training, experience, qualifications, age and salary required to Box No. 2786, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

DEPARTMENT of Scientific and Industrial Research. Applications are invited for the post of **Director** of the **Chemical Research Laboratory** at Teddington, Middlesex. Candidates must have been born on or before 1st August, 1914, and must have high academic qualifications, together with extensive experience of research and the organisation of chemical research, and a broad outlook on the application of chemical research to industry. The salary at present attaching to the post is £1,950 per annum for a man (£1,775 for a woman) and superannuation provision will be made under the Federated Superannuation System for Universities.

Further particulars and application forms may be obtained from the **Secretary, Civil Service Commission, Scientific Branch, 27, Grosvenor Square, London, W.1.,** quoting No. 2490; completed applications must be returned by 29th April, 1949. 2123/150.

FIRST-CLASS Importing House has opening for young man with commercial mind and preferably with scientific background. Commencing salary, £300 per annum, and good prospects. Write Box No. 2788, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

LARGE Petroleum Company has vacancy in London for **Chemist** with experience in Organic Chemicals, plastics and allied fields, preferably with Degree. Age 25 to 30 years. Good prospects. Pension Fund rights. Write giving full particulars of education and experience, to **Box Z.G.983, Deacon's Advertising, 36, Leadenhall Street, E.C.3.**

LARGE Petroleum Company has vacancy in London for **Chemist** with experience, in the detergent field, preferably with Degree. Age 25 to 30 years. Good prospects. Pension Fund rights. Write, giving full particulars of education and experience, to **Box ZF.982, Deacon's Advertising, 36, Leadenhall Street, E.C.3.**

REQUIRED, **Three Production Chemists,** for training as Shift Supervisors in Chemical Factory. Applicants should possess B.Sc. Degree or equivalent, and should preferably have had some industrial experience. Age group up to 30. Good prospects to right men. Apply, giving full details and salary required, to **THE FULLER'S EARTH UNION, LTD., Patteson Court, Nutfield Road, Redhill.**

RESEARCH CHEMISTS. The Midland Tar Distillers, Ltd., Oldbury, Nr. Birmingham, have vacancies in their research department for Chemists with good Degrees in Chemistry. A few years' industrial experience an advantage. Good salaries will be paid to qualified men, and a contributory pensions scheme is in operation. Apply, with full particulars, to PERSONNEL MANAGER.

SITUATIONS VACANT

MINISTRY OF SUPPLY invites applications for two vacancies in the grade of Principal Scientific Officer at a Research and Development Establishment near London.

(1) MECHANICAL OR CHEMICAL ENGINEER (Ref. F.223/49A), for work on the design and development of rockets and associated problems. Experience of fuel combustion problems would be an advantage.

(2) MECHANICAL OR ELECTRICAL ENGINEER (Ref. C.208/49A), for work on artillery equipments and associated engineering problems. Experience of high quality engineering design, e.g., power units, servo motors, hydraulic gear, remote power control, automatic feed mechanism, etc., is essential.

Candidates, who must be at least 31 years of age, should have an Honours Degree or equivalent qualification in Mechanical, Electrical or Chemical Engineering, as appropriate.

Salary will be assessed within the range £910-£1,177. Rates for women are somewhat lower. The posts are unestablished but carry F.S.S.U. benefits.

Application forms obtainable from the **Technical and Scientific Register (K), York House, Kingsway, London, W.C.2,** quoting the appropriate reference number.

Closing date will be 14th May, 1949. 16.3A20(30).

PETROCARBON LIMITED require Assistant Mechanical Engineer. The position is a permanent one with an attractive salary and prospects for an applicant with proved technical and practical ability in general engineering, coupled with experience in workshop organisation, management and labour control. Previous experience in chemical plant maintenance would be an advantage. Applications, in the first instance, in writing, to **Personnel Manager, Petrocarbon Limited, Partington Industrial Estate, Urmston, Manchester.**

TECHNICAL Assistant for Chemical Products required by large Petroleum Company to cover North and North-West London Areas. Applicants should have Degree in Chemistry and, if possible, Commercial experience. Age 20 to 26 years. Good prospects. Pension Fund rights. Write **Box Z.U.971, Deacon's Advertising, 36, Leadenhall Street, E.C.3.**

TECHNICAL REPRESENTATIVE for Chemical Products required by large Petroleum Company to cover Oxfordshire, Buckinghamshire, Bedfordshire, Hertfordshire and Berkshire Areas. Applicants should have Degree in Chemistry and if possible, Commercial experience. Age 25 to 30 years. Good prospects. Pension Fund rights. Write **Box Z.T.970, Deacon's Advertising, 36, Leadenhall Street, E.C.3.**

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CHEMIST, B.Sc., A.R.I.C., many years senior responsible position in leading light engineering concern, paints, plating, vitreous enamel, metal surface treatment, etc., production and laboratory control, sales and service liaison. Would like change. Technical, Technical-Commercial, Industrial Consultant. London area. Box No. 2785, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WORKING NOTICES

THE proprietor of British Patent No. 587634, entitled "Improvements in or relating to tubular furnaces for distilling or cracking processes," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, EHLERT, STERN & CARLBERG, 28E. Jackson Boulevard, Chicago 4 Illinois, U.S.A.

THE Proprietor of British Patent No. 479713, entitled "An improved furnace for heating granular materials," offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, EHLERT, STERN & CARLBERG. 28 E. Jackson Blvd., Chicago 4, Illinois, U.S.A.

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TWO—Alite **POWDER FILLING MACHINES** for loose fillings. Hoppers 1 ft. 8 in. diam. by 1 ft. 2 in. deep, fitted agitators driven from ½ h.p. motor, 200/230v. single-phase.

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